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ABSTRACT

The emphasis of the symposium was the Internet, or information superhighway, and the provision of information services to end users. Many internationally recognized librarians shared their experiences and expressed their ideas on new developments and possibilities related to the information superhighway. The 34 papers presented at the symposium addressed the following issues: (1) definition, applications, cost, security, privacy, access, delivery, and ease of use; (2) strategies and tactics for accessing information on the superhighway, as well as concern for unauthorized use; (3) tremendous amounts of irrelevant information, and who will regulate the superhighway; (4) librarians and Internet developer cooperation in developing user-oriented services on the Internet; (5) electronic publishing of academic research; (6) provision of access to users in the third world; (7) cyberspace as a process of virtualization, and the resultant virtual electronic library; (8) librarians should not only give access to electronic information, but also adapt their organizations to achieve full functionality of new developments; (9) collaboration among research centers, administrative groups and operational, informational, and resource staff in libraries and information systems is vital; (10) the impact of technology on academic libraries has resulted in increased access to resources in electronic form, calling for additional staff training; (11) the development of electronic resources has been so rapid that many information professionals have been left behind; (12) lack of information quality control, and increased forms of access require librarians to enhance resource selection activities; (13) access to resources no longer needs to be intervened by trained professionals, and the future role of the librarian is uncertain; (14) making electronic resources Internet accessible is a concern; (15) a discussion of projects involving scanning tables of contents of scientific journals to be accessed online; (16) libraries have to adapt their organization and management to achieve full functionality of new developments; and (17) implications and possible impact of distributed client-server computing to potentially facilitate use of the Internet as a global information resource which may be searched in its own right. The symposium agenda, list of participants, and list of participating vendors is also provided. Many papers contain references. (MAS)

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Edited by

Ahmed H. Helal
Joachim W. Weiss

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Information Superhighway : The Role of Librarians, Information Scientists, and Intermediaries

17th International Essen Symposium
24 October - 27 October 1994

Festschrift in honor of
Frederick Wilfrid Lancaster

Edited by
Ahmed H. Helal
Joachim W. Weiss

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Table of Contents

Preface XI

Agenda of the Seminar XX

List of Participants XXV

Participating Vendors XLVI

Sheila Corrall
Information Specialists of the Future :
Professional Development and Renewal 1

Michel Bauwens
Cyberspace, Virtualization, and the Role of Cybrarians 12

Johan C. de Vries / Leo D. Minnigh
Information Specialists in the Future Academic Library :
Flexible Tightrope Walkers 13

William Goodrich Jones
Have Librarians Failed Librarianship? A Reply to Lancaster 27

Herbert S. White
The Role of Information Intermediaries and the Superhighway :
Crucial, Important, Trivial, or Non-Existent? 47

Greg Anderson
MIT - The Distributed Library Initiative :
Collaboration, Vision, Prototyping 61

John Lawrence Eyre
The ELISE Project : Visual Information Retrieval and Delivery 90

Joan M. Day / Catherine Edwards / Graham Walton
IMPEL : A Research Project into the Impact on People of
Electronic Libraries - Stage one - Librarians 108

Alex V. Sijtsma
The MECANO System : A Mechanism of Automatic Comparison
of CD-ROM Answers with OPACs 117

Reinhard Nedela
Managing CD Changers of 6-777 CDs or a Multiple of that with PeriLIB Library Controller 124

Gerold Ritter
CD-ROM Server in the Internet 131

Andrew G. Torok
Technological Speedtraps on the Information Superhighway 134

Suzanne Fedunok
Internet One : The Binghamton University Libraries' Interface to the Internet 148

Lisbeth Björklund / Roland Hjerppe / Andreas Björklind
Highways and Backroads of Internet : Strategies and Tactics 164

Kate T. Noerr
Information Superhighway in Singapore 179
(full paper not received in time due to extraordinary circumstances)

Christine Bossmeyer / Bernd Luchner
DBV OSI II : Open Communication between Library and Information Retrieval Systems 180

Titia van der Werf-Davelaar
Organizing Fileservers on the Internet : Role of the Library 194

Frederick Wilfrid Lancaster
Networked Electronic Publishing of the Results of Scholarly Research 207

Christiaan C. P. Kluiters
CAPCAS as a Route to the Digital Library 226

Thomas W. Place
From Online Contents to Online Articles : Developing New Library Services at Tilburg University 232

Janet Mitchell / Per Halberg
End-User Searching and Document Ordering : The Experience with the OCLC FirstSearch Service 243

Robert Simon
ALEPH : New Approach to Library System's Architecture 255

Maurice B. Line
Who Pays for Information? And Why should They? 262

Alex C. Klugkist
Open Library Networking and Interlibrary Cooperation 276

David Stoker / Alison Cooke
Evaluation of Networked Information Sources 287

Stephen Richard
Driver Education for the Superhighway : C.A.L. for End Users 313

Paul Nieuwenhuysen
Development of Slides about Information Retrieval,
Using a Presentation Software Package 325

Anthony M. Angiletta
Collection Development in the Large American Research Library :
At an End or at a Beginning? 337

Kathryn Arnold
User Aspects of the ELINOR Electronic Library 349

Beth Sandore
Remote Use of the Virtual Library : End User Needs 360
(full paper not received in time due to extraordinary circumstances)

Sigrid Reinitzer
The Function of a Traditional Library as a Virtual Library :
A Comparison 361

Shmuel Sever / Cecilia H. Harel
Managing the Virtual Library : Issues and Challenges 369

Irene Sever
Academic Library Users and Electronic Retrieval Systems 383

Jenny Walton
Conference Summary 395

Index 402

17th International
Essen Symposium 1994

Essen University Library

Information Superhighway : The Role of Librarians, Information Scientists, and Intermediaries

24 October - 27 October 1994

Preface

The annual International Essen Symposium is a great opportunity meeting distinguished colleagues and getting the most updated information about the latest developments in library and information technology. All International Essen Symposia are exciting events gathering international colleagues and friends of high caliber and focusing on hot topics.

The 17th International Essen Symposium 1994 was held, as traditionally, in Essen University Library during the period from 24th to 27th October, 1994 with a total attendance of about 120 invited participants, 33 speakers, and 22 vendors. The emphasis of the Symposium was definitely related to "Internet - Superhighway" and the provision of information services to the end users. As in the previous Symposia, internationally recognized librarians, specialized in their field, expressed their experience and ideas on new developments and possibilities in concern with the theme "Information Superhighway : The Role of Librarians, Information Scientists, and Intermediaries".

The 17th International Essen Symposium was held and devoted to an outstanding leader and worldwide known library educator - to Professor Dr. Frederick Wilfrid Lancaster.

Frederick Wilfrid Lancaster is a Professor Emeritus in the Graduate School of Library and Information Science at the University of Illinois at Urbana-

Champaign where he has taught courses relating to *information transfer, bibliometrics, bibliographic organization,* and *evaluation of library and information services.*

He was born on September 4th, 1933 in Stanley, Durham, United Kingdom. F. Wilfrid Lancaster graduated from the "Newcastle-upon-Tyne School of Librarianship" and became a *Fellow (by thesis) of the British Library Association* in 1969.

In 1959 F. Wilfrid Lancaster moved to the United States of America where he has held various posts in the field of Library and Information Science ever since. After working as *Senior research assistant for ASLIB* (Association of Special Libraries and Information Bureaux), London, in 1962 he became *Resident Consultant and head of the System Evaluation Group Herner & Co.* from 1964 - 65. He moved on to the National Library of Medicine, Bethesda, Maryland, to take over the post of *Information Systems Specialist* from 1965 - 1968 and from 1969 - 1970 he was *Director of the Information Retrieval Services at the Westat Research Inc., Bethesda, Maryland.*

In 1970 began his association with the University of Illinois, Urbana-Champaign, where he was *Associate Professor for Library Science* until 1972 when he became *Professor for Library Science*. F. Wilfrid Lancaster has been an educator in the field of library and information science at the University of Illinois, Urbana-Champaign, ever since.

He has also worked as a *consultant for the CIA* from 1970 - 1977 and continues his work as a *consultant for UNESCO*, Paris.

F. Wilfrid Lancaster, who has also been a *Fulbright fellow* in the years 1975, 1985 and 1991, is a member of the American Library Association, The American Society for Information Science and "Phi Kappa Phi". He is also the chairman of the *Clinic on Library Applications of Data Processing*, an annual conference which was first held at the University of Illinois in 1963 and which deals with "the major challenge of the profession in our generation - [which is] posed by the mounting volume of publication in combination with the increased use of a complex technological society for factual information."

F. Wilfrid Lancaster has a major influence and impact in the fields of information systems and the evaluation of library services. Lancaster's contributions have been made through writing, teaching and consulting. His major contributions have been in the areas of vocabulary control, interaction between system and user, evaluation of systems effectiveness, and the implications of advanced information systems for the future of libraries in society. Lancaster's strongest impact was on the development of criteria and procedures for the evaluation of systems performance, mainly through the extension, refinement, and application of concepts pioneered by the *Cranfield Studies*.

The more general significance of Lancaster's work results from his ability to combine a rigorous and thorough approach with a clarity of expression that renders advanced concepts of information retrieval accessible to the student and the practicing librarian without oversimplification.

He is the author of numerous articles and of 12 books, many of them have received national awards. His book on indexing and abstracting was awarded the Best Information Science Book Award by the American Society for Information Science. Some of his books have been translated into Russian, Chinese, Japanese, Arabic and Spanish.

Since 1986 he is the editor of Library trends and since 1987 he is associate editor of Libri.

He has won several acclaimed awards and honors:

- Recipient of fellowship from Spanish Ministry of Education for teaching and research at the University of Granada, February-June 1994
- Fulbright Teaching Fellow in India (Indian Statistical Institute), 1991
- Selected by the University of Illinois as University Scholar for the period 1989-1992
- Recipient of the G. K. Hall Award of the American Library Association for best book on library science, 1989
- Recipient of the 1988 Award of Merit of the American Society for Information Science, 1988
- Appointed as Visiting Professor in the College of Library and Information Science, Wuhan University, 1988
- Fulbright teaching fellow in Denmark (The Royal School of Librarianship), 1985
- Recipient of the first Outstanding Information Science Teacher award, American Society for Information Science, 1980

- Recipient of the John Brubaker Memorial Award for the best paper of 1980, in Catholic Library World. Presented at the Catholic Library Association Annual Convention
- Recipient of the 1970, 1975, and 1979 award by the American Society for Information Science for the best book of the year on information science
- Recipient of the 1978 Ralph Shaw Award for outstanding contribution to the literature of library science
- Postdoctoral fellowship, Norwegian Council for Scientific and Industrial Research, Norsk Senter for Informatikk, 1976
- Fulbright teaching fellow in Brasil (Instituto Brasileiro de Informacao em Ciencia e Technologia), 1975
- Elected to "PHI KAPPA PHI", University of Illinois chapter, 1971
- Paper "MEDLARS: Report on the Evaluation of its Operating Efficiency" (first published in American Documentation, April 1969) received "best paper" award in 1969 from the American Society for Information Science.

The International Essen Symposium 1994 addressed the Superhighway or Internet as it is the hottest topic in information services and technology today. It is hardly difficult to attend any meeting that goes without any mention of the Internet. Accordingly, the magic word at the 1994 International Essen Symposium was the "Superhighway-Internet". The Internet, an electronic computer network connecting millions of computers around the world, is a vast network of networks interconnecting thousands of networks worldwide.

Librarians and libraries are excited about the rapid development and wide use of the Internet. It offers an easy access to information and bringing the users to the real "electronic library". Moreover, the Internet represents the "Information Superhighway" bringing the information directly to the home and/or office of the end user. It is the most popular vehicle for multimedia messaging. The final aim of Internet is to link all the text, data, digital sounds, graphics, and video into a single interlinked hypermedia World Wide Web (WWW) project.

Internet, the global information highway is a reality and more people and institutions are seeking information and exploring each opportunity available on the Internet and networks. Scientists, researchers, and information seekers are satisfied with the wealth of information available on the Internet and too many other resources. The speed with which information can be extracted, disseminated, and dispersed in digital format offers a vast range of opportunities with the possibility of misuse of data and information. Like all other technologies, the Information Superhighway offers the potential elevate of humankind.

However, the individual capacity to absorb information does not expand at the rate at which the information becomes available: critical interpretation, intelligent selection and navigation of information sources are essential to be able to read and react critically to information rather than having undigested information.

Moreover, the Internet is increasingly seen as a business tool for researching market trends and stock market data. Historically, it began certainly in the USA, for some years now and as a method of communication for computer scientists and members of the academia. However, the amount of information available now do include material of a broad interest than the strictly narrow scientific and academic fields. The commercial market has woken up to the financial potentials of the Internet moving it away from the academic circle to the sphere of the commercial world. Over half of all traffic across the Internet is commercial in nature.

The potential benefits of information technology and advanced technologies of communication completely forces us in remodeling our libraries and achieving new organizational objectives. These revolutionary changes associated with modern techniques imposes on us to think over the status of librarianship as a profession. It is expected that the practice of librarianship and the potential of information technology will change the nature of the work experienced by the librarians. A transformation of the work of librarians is underway and will be other than it was and is, and surely will never come to end.

The most fundamental threat to librarians originates in the possibility of automation of their functions, advanced technologies of communication, absence of managing the information, and lack of conviction. However, it will take some time before technology reaches the line of total replacement of librarians. Nevertheless, some technologies are already employed in the virtual libraries and not dependent on active/interactive human communication. The result is reducing the number of professional librarians.

From the above mentioned, it is obvious that the extension of access to Internet to users of all kinds will have a profound effect and impact on the role of librarians and libraries of all kinds. Academic and special libraries are no longer frequently visited by information users for consultation or borrowing materials. Too many of them can search for and retrieve the material and information they require without leaving their office. Libraries and librarians, as they are mediators of access to information will be the most transformed and have to undertake an active role in this new information era.

The speakers of the International Essen Symposium 1994 stressed on a great variety and wide range of diverse facets and illustrated our presence in order to meet the needs of the future. The outcomes of the 1994 Symposium can be summarized in the following salient issues:

- The Information Superhighway has often been referred to as the "Superhypeway". Global information infrastructure combining audio, video, and graphics are tempered by technological problems and social reality. Applications of Information Superhighway include publishing, entertainment, broadcasting, education, banking, retailing, libraries, and more. However, we have to keep in mind: cost of services, security, privacy, access, delivery, and ease of use.
- The Superhighway or the Internet is only good when you know where to go and want to go there. However, strategies and tactics for choosing the right type of way in different situations are tools to access material and operate on. However, some countries as the Singapore government has expressed its concerns about the unauthorized use of the Information Superhighway, particularly with regard to pornography, betting and financial transactions.
- What information users already face, and what they will increasingly face, is the problem of tremendous volumes of information, most of it irrelevant and annoying. We will require a new profession of information traffic policeman, individuals who can be respected and trusted.
- The Internet developers tackle the information explosion mainly from a technological point of view. However, librarians and information specialists need to master this rapidly involving and overwhelming technological environment for the management of networked document servers in order to help controlling and steering the

information waves on the Internet. Libraries need to move beyond the scope of the traditional bibliographic utilities and join efforts with the Internet working groups to develop true customer-oriented services of the Internet.

- University librarians and academic administrators object to having to buy back the results of academic research from publishers, many in the for-profit sector, at ever-escalating costs. At the same time, it is becoming more widely recognized that academia is now able to contemplate an alternative approach - networked publishing of research results in electronic form. Nearly all of the costs that occur at the various points in the formatting production and access chain are ultimately borne by institutions, though research bodies my fund some of them.
- The provision of access to users in the third world should be regarded as an investment in a long term market and in political stability. Information is expensive, but not unaffordably so.
- Cyberspace is a process of virtualization, whereby direct interaction between people and between people and things will increasingly be mediated by the computer and cybrarian who does not operate between stacks of books, but in a total electronic environment.
- Librarians have too closely allied themselves with the interests of technology and attempting to strengthen librarianship by redefining it in the language of information technology. Librarians have already lost the context of current thinking about the adaptation of professions to change.
- Giving access by itself is not sufficient to improve library service. Libraries have to adapt their organization and their management to achieve the full functionality of the new developments.
- Collaboration among research centers, administrative groups and operational, informational, and resource staff in libraries and information systems is a must and requires excellent communications and working together to create cross-organizational, cross-functional teams to accomplish work. It is absolutely vital that librarians and computer staff cooperate for their mutual benefit.
- The impact created through the convergence of computing and communications technology on academic libraries, as the traditional

archival role, is now giving increasingly more access in electronic form. Implications of library staff and the need for adequate staff training is a necessity.

- The development of information resources across the Superhighway "Internet" has been so rapid and swift that many library and information services professionals have been left behind and can not cope with the new situation. Moreover, there are too many users who know more about information sources than the librarians who are no more playing a significant role in this arena.
- There is little or no control over the quality, or even the legality, of information made available in this way. Moreover, many Internet sources are available at no cost and in a number of formats: text, pictures, sound, and video. Consequently, librarians must move away from mono- to multimedia applications and enhance our activities and skills in these fields as well as in networking.
- Distributed client-server computing has the potential to facilitate use of the Internet as a global information resource which may be searched in its own right. The implications of such a technology and its possible impact on the use of Internet by information specialists is obvious.
- The access to resources no longer needs to have the intervention of trained professionals: rather education of the searcher is required. The relatively maples Superhighway is greater than can be given by existing information workers or librarians in traditional formats. Moreover, what a large research library should look like in the next decade, both in terms of its collection and access to information, and what the research librarians craft should be is still unknown.
- Thousands of libraries, colleges and universities, and other institutions now provide Internet access to good information services. However, how can an institution effectively use the structure of Internet browsing software to convey information about services and policies, as well as to provide a method for interaction with remote users, is still unexplored. How to make electronic resources Internet accessible is the concern of all librarians. Paradoxically, while access to information has been technologically facilitated through Internet, the process of locating desired information has become more complex for the user.

- Some university libraries, like the Tilburg University Library, started its Online Contents Project, i.e. scanning the tables of contents of scientific journals. Further cooperation with publishers such as Elsevier and institutions such as the National Library in The Hague as well as PICA cooperative system are a reality. However, nowadays most of the Online Contents Records are supplied by Swets via PICA.

As the previous Symposia, the 1994 Symposium gave all participants, speakers, and vendors the utmost opportunity to keep informed about any progress, innovation, and/or new methods introduced. This publication, volume 18 in the series *Publications of Essen University Library*, may provide colleagues interested in the topic "Information Superhighway" with additional readings.

We would like to express our appreciation to the organization committee of the Essen Symposia, especially to Mrs. Doris Pohl. On behalf of the organizing committee of the Essen Symposia, we would like to extend our sincere thanks and appreciation to all speakers, participants, and vendors who added to the success and encourage its continuation. Moreover, and in the name of all who attended the Symposium, it was a pleasure and honor for all of us to have Professor Dr. Frederick Wilfrid Lancaster as honorary guest. He is one of the leaders in library sciences in the international arena.

Essen, January 1995

A. H. Helal
J. W. Weiss

17th International
Essen Symposium 1994

Essen University Library

Information Superhighway : The Role of Librarians, Informaticn Scientists, and Intermediaries

24 October - 27 October
1994

Agenda

Monday, 24 October

10.00 Registration
11.00 Vendors presentation
14.15 Opening of Symposium
Ahmed Helmi Helal

Chairman: **Ahmed Helmi Helal**

14.30 Information Specialists of the Future :
Professional Development and Renewal
Sheila Corrall

15.15 Discussion
Coffee

16.00 Cyberspace, Virtualization, and the Role of Cybrarians
Michel Bauwens

16.30 Information Specialists in the Future Academic Library :
Flexible Tightrope Walkers
Johan C. de Vries / Leo D. Minnigh

17.00 Discussion
Coffee

19.30 Reception

Evening lecture:

Have Librarians Failed Librarianship?
A Reply to Lancaster
William Goodrich Jones

Tuesday, 25 October

Chairman: **Peter Noerr**

9.30 The Role of Information Intermediaries and the Superhighway : Crucial, Important, Trivial, or Non-Existent?
Herbert S. White

10.00 Discussion

10.15 MIT - The Distributed Library Initiative :
Collaboration, Vision, Prototyping
Greg Anderson

10.45 Discussion

Coffee

11.30 *Short Communications*

The ELISE Project :
Visual Information Retrieval and Delivery
John Lawrence Eyre

IMPEL : A Research Project into the Impact on People of Electronic Libraries - Stage one - Librarians
Joan M. Day / Catherine Edwards / Graham Walton

12.00 Discussion

12.15 The MECANO System : A Mechanism of Automatic Comparison of CD-ROM Answers with OPACs
Alex V. Sijtsma

Managing CD Changers of 6-777 CDs or a Multiple of that with PeriLIB Library Controller
Reinhard Nedela

CD-ROM Server in the Internet
Gerold Ritter

13.00 Discussion

Lunch break

Chairwoman: **Genevieve Clavel**

14.30 Technological Speedtraps on the Information Superhighway
Andrew G. Torok

15.00 Discussion
Coffee

15.45 *Short Communications*

Internet One : The Binghamton University Libraries' Interface to the Internet
Suzanne Fedunok

Highways and Backroads of Internet : Strategies and Tactics
Lisbeth Björklund / Roland Hjerppe / Andreas Björklind

Information Superhighway in Singapore
Kate T. Noerr

16.30 Discussion

16.45 *Short Communications*

DBV OSI II : Open Communication between Library and Information Retrieval Systems
Christine Bossmeyer / Bernd Luchner

Organizing Fileservers on the Internet : Role of the Library
Titia van der Werf-Davelaar

17.15 Discussion
Coffee

19.30 Reception

Wednesday, 26 October

Chairwoman: **Ariane Iljon**

9.30 Networked Electronic Publishing of the Results of Scholarly Research
Frederick Wilfrid Lancaster

10.15 Discussion
Coffee

11.00 *Short Communications*

CAPCAS as a Route to the Digital Library
Christiaan C. P. Kluiters

From Online Contents to Online Articles :
Developing New Library Services at Tilburg University
Thomas W. Place

End-User Searching and Document Ordering :
The Experience with the OCLC FirstSearch Service
Janet Mitchell / Per Halberg

ALEPH :
New Approach to Library System's Architecture
Robert Simon

12.00 Discussion
Lunch break

Chairwoman: **Monika Segbert**

14.00 Who Pays for Information? And Why should They?
Maurice B. Line

14.30 Discussion

14.45 *Short Communications*

Open Library Networking and Interlibrary Cooperation
Alex C. Klugkist

Evaluation of Networked Information Sources
David Stoker / Alison Cooke

15.15 Discussion
Coffee

16.00 *Short Communications*

Driver Education for the Superhighway :
C.A.L. for End Users
Stephen Richard

Development of Slides about Information Retrieval.
Using a Presentation Software Package
Paul Nieuwenhuysen

16.30 Discussion
Coffee

19.30 Reception

Thursday, 27 October

Chairman: **Bernard Gallivan**

9.30 Collection Development in the Large American Research Library : At an End or at a Beginning?
Anthony M. Angiletta

10.00 Discussion
Coffee

10.45 *Short Communications*

User Aspects of the ELINOR Electronic Library
Kathryn Arnold

Remote Use of the Virtual Library : End User Needs
Beth Sandore

The Function of a Traditional Library as a Virtual Library : A Comparison
Sigrid Reinitzer

Managing the Virtual Library : Issues and Challenges
Shmuel Sever / Cecilia H. Harel

Academic Library Users and Electronic Retrieval Systems
Irene Sever

12.00 Discussion

12.15 Conference Summary
Jenny Walton

12.30 Close of Symposium

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17th International Essen Symposium 1994

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Information Specialists of the Future : Professional Development and Renewal

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Abstract

The electronic library and networked information services have prompted a review of the roles and responsibilities of information professionals. The technical demands of the job are expanding and at the same time a wider set of management and business skills will be required as the focus shifts from providing information to facilitating access for end-users. The implications for education and training are significant and continuing professional development has become more important as the pace of change quickens and environmental factors exert pressure on financial, physical and human resources. Flexible responses will be essential to meet the needs of the 21st century.

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Some commentators predict the demise of the information professional, others envisage an enhanced role, emphasising the expertise required to assess the cost-effectiveness of different options for information delivery. Survival of the species will depend on competence, commitment and capacity for change. The knowledge, skills and attitudes required must be fully understood by all, and both organisations and individuals have to take responsibility for creating a framework for growth. Management development has become a strategic priority for all types of library and information services, and education and training providers need to devise new programmes to develop "Information Superprofessionals" for the Information Superhighway.

Context

The advent of the electronic library and developments in networked information services have prompted a comprehensive review of the roles and responsibilities of information professionals. The environmental pressures affecting the library and information community are well known and have been fully documented elsewhere, notably in three seminal reports published in the UK during the past year.[1,2,3] The trends identified include not only technological issues, but also economic, political and socio-demographic factors. Consideration of the impact of these developments has tended to concentrate on academic and research libraries, but there are significant implications for all types of library and information services (LIS). The issues also extend beyond LIS, as information management is becoming a major corporate concern, and beginning to be recognised as an important strategic issue for organisations in both public and private sectors.

Information technology (IT) developments continue to dominate our landscape: the rapid pace of developments in networking technologies and multimedia systems (for example) is quite astonishing. The continuing rise in the world's published output is complicated by the multiplicity of formats emerging, again influenced by IT developments. At the same time, the demand for information is growing, costs are surging upwards relentlessly at a rate significantly higher than general inflation, but LIS budgets are increasingly constrained. Political pressures have forced LIS managers to work hard for their diminishing share of organisational resources; they have become more accountable for their actions and spending decisions, and have to demonstrate value for money to their parent institutions and funding bodies. Quality has become one of the current buzzwords, with consumer choice a critical issue, and the customer base itself has become more diverse as a result of demographic changes. IT has also played its part in the globalisation of our environment, as computing and telecommunications technologies enable, indeed oblige us, to look beyond local and national provision and to acknowledge that we must become actors in the international arena.

The key points to note here are the complexity of the current situation, the fact that the pace of change is not easing but accelerating, and that we must expect these pressures to continue. Of particular significance is the growth in information supply and demand, the diversity in information products and services - and also among existing and potential customers - and the organisational imperatives to deliver relevance, quality and cost-effectiveness. Organisational scrutiny of information systems and information management has put the spotlight on the relationship between libraries and other information-related activities, so we see blurring of boundaries and confusion of roles between LIS and other functional units. A recent informal survey of UK universities showed that some degree of administrative 'convergence' between libraries and computer centres had taken place in about half of the institutions, with 38 (around one third) having a single executive director for the two previously separate services.[4]

Crisis of Identity

The LIS profession seems to be suffering from some sort of identity crisis. As we speculate about our future, the urge to redefine our role is overwhelming, and the range of names offered by commentators is impressive. Here are a few recent examples taken from the professional press:

- electronic library
- library without walls
- networked library
- desktop library
- logical library
- virtual library
- information nerve centre
- information management centre
- Information to Knowledge Advisory Centre (InfoKAC).

The names advanced for information professionals are even more interesting, and there are more of them:

- reference/subject librarians
- information resource managers
- information co-ordinators
- information linking agents
- information/knowledge managers
- information/knowledge navigators
- corporate intelligence professionals
- information consultants
- information counsellors
- information architects
- information engineers
- access engineers
- information catalysts
- cybrarians.

The common theme here is the attempt to reposition ourselves and signal through the change of title that we do more than simply provide information in response to demand. [5,6]

Transformations

There is a serious point underlying this play with words. Libraries are undergoing a series of transformations, and the total effect of these changes amounts to a revolution in the way we deliver our services, our whole philosophy of service, and how we are organised. We are experiencing big shifts in our customer orientation, and it is not only our systems which are moving from standalone to networked - our people need to be organisational networkers, effective at communicating and liaising with customers and suppliers. To achieve this we need different structures and looser controls; more authority and autonomy for people who design, develop and deliver services; new styles of management and teamworking, and active involvement of everyone in the planning process.

Service development

Changes in technology, funding and information provision have forced us to reconsider service models. The move from a holdings/ownership strategy to an access strategy can be traced back over the last two decades as rising literature costs and budget pressures have put public and academic libraries in a situation where self-sufficiency is clearly an untenable goal. Commercial and industrial information services have traditionally adopted this model, but universities have been reluctant to abandon their collection-building ambitions, having tended to equate quality of service with volume of holdings. The shift from print to electronic sources has encouraged progress in this direction and coupled with continuing scrutiny of the efficiency and effectiveness of service provision has brought about a significant change in service philosophy. The whole ethos has changed from a passive/reactive stance to a more proactive outlook, which assumes an understanding of client needs and the flexibility to deliver information 'just in time' - rather than the acquisition of material 'just in case'.

End-user searching and networked access to electronic information systems have also altered the balance of service from providing information to facilitating self-service access. These trends have wider implications which extend beyond adopting a more customer-oriented approach as they presume the ability to transfer information handling skills to end-users; they also pose more complex questions about the evaluation of numerous different products entering the market, about copyright and licensing arrangements, and about funding and charging mechanisms. There is more scope for customisation - tailoring services to the needs of particular groups or individuals - but LIS managers have an important role in ensuring cost-effective provision for the organisation as a whole, and will need to strike the right balance between supporting and empowering clients and exercising professional judgement on their behalf.

Structures and styles

Many people have pointed out that traditional hierarchies impede flexible responses to new problems. Lee argues that we must not only redefine our role, but redefine our organisation for carrying out that role. Structures supporting change will be cross-divisional and cross-functional, encouraging "fluidity of boundaries", creating "multiple ties and relationships [that] will crisscross the organization chart". People will operate within a complex network of vertical, horizontal and diagonal relationships. We shall still need properly defined jobs and clear reporting lines, but multidisciplinary teamwork, cross-functional task forces and "dotted line reporting relationships" will become the norm. Flat structures and matrix management arrangements are already fairly familiar ideas, but Lee goes beyond this to "the concept of a second organization, a parallel or shadow organization that links the separate units of the maintenance-oriented organization in flexible shifting ways to solve problems and guide changes".[7]

Different management styles and skills will be needed in this new environment, with a shift from managing individuals to managing teams, and an emphasis on developing the resources of the group rather than controlling it. Lewis presents a comprehensive and cogent case for getting rid of "the stifling effect of the controlling and co-ordinating mechanisms on our service goals". He urges that reference librarians/information specialists be given the authority and autonomy to take decisions and allocate resources to meet customer needs. Managers must assume the role of "managing partner" rather than supervisor, concentrating on managing decision-making and communication *processes* - not determining strategies in top-down mode, but facilitating participative planning, involving all levels of staff in a more fluid middle-up-down process.[8]

Competencies

There have been several attempts recently to identify the competencies required of information professionals in the future. In 1991, Woodsworth and Lester examined the staffing needs of a model future research library in order to inform curriculum development for the professional education of library and information specialists. Their work drew on the published results of three previous surveys, as well as the expressed views of prominent members of the profession, and they concluded that the latter offered more useful guidance and that dialogues involving the best futuristic thinkers among both practitioners and educators were most likely to provide the basis for sound strategic planning.[9] In a more concise treatment, Ojala sets out her views of the requirements for managing the special library of the future, offering further references to support her conclusions, which are broadly similar to the earlier work.[10]

A key finding emerging from these investigations is the growing importance of 'organisational' competencies - more generic managerial abilities which are not specific to the LIS profession. Some writers go further and suggest that projected changes in society mean that information specialists will need to have an increased understanding of cultural diversity and the impact of a culturally diverse population on information behaviour, translating this into a need for increased interdisciplinarity in educational programmes, to incorporate areas such as policy studies, communication theory and cognitive psychology.[11] The core competencies identified from these studies are summarised below.

Information (professional/technical) competencies

- Understanding of information sources and how to access them
- Knowledge of technologies and ability to deliver information in any format
- Ability to evaluate quality of information, and thus add value
- Ability to organise information to create customised knowledge
- Ability to anticipate and analyse customer needs (by monitoring)
- Ability to connect disparate pieces to originate new information
- Knowledge of when, how - and whether - to store information
- Understanding of the generation, transfer and use of information
- Understanding of economic and legal aspects of information

Organisation (managerial/interpersonal) competencies

- Understanding of the organisational environment, culture and alliances
- Expertise in the dynamics of teams/small groups in an online environment
- Ability to communicate using a variety of media throughout the organisation
- Ability to market and sell information products, including negotiating with vendors
- Ability to empower customers and guide them to a range of alternative sources
- Ability to develop, design and deliver instructional programmes
- Ability to operate effectively in the political arena, locally and nationally
- Ability to provide leadership and vision within the organisation
- Ability to force information to permeate the organisation

Adding value, creating 'customised knowledge' and originating new information are important concepts among the first group, as development of these abilities will surely help to distinguish the LIS professional's contribution from that of others including the competent end-user. The second group reflects the imperative for information professionals to be able to operate effectively in the organisational environment, in particular to understand what the organisation is about and how it works; to be able to relate effectively to customers and other stakeholders; and to have the necessary knowledge, skills and insights to *enable customers to become competent* in finding, handling and managing information. They must also become 'information champions' within the organisation, and exert influence on the strategic use of information, which requires both political skills and personal confidence.

Convergence

One of the challenges we face at present is on the one hand to form effective strategic alliances within the organisation, and on the other hand to differentiate our contribution from other major players. Of relevance to this debate is the study by Woodsworth and others in the United States on the "information job family". Their research identified a list of common elements in the jobs of library and computing staff; the focus of the study was on academic libraries, but the findings are also applicable to other organisations. This work poses very interesting questions not only about roles and responsibilities, but also about professional education and qualifications, continuing development and training, and - probably most contentious of all - salaries and conditions of service.[12] The common job activities identified were as follows:

- Develop training tools and system documentation
- Design, operate and use local and wide area networks
- Plan, select and operate system hardware and software
- Collect and organise information in various forms and formats
- Create, maintain, query and manage databases
- Analyse user, service and system needs
- Provide consulting and technical assistance
- Instruct faculty, students and staff in all of the above

The authors also point out that in addition to the common activities, the two groups of staff generally had similar goals, described as "helping users to access, manipulate, or use information - in all its definitions - through the optimum use of hardware, software, and communications systems" (although they might use different terminology). The physical settings in which these activities take place are also becoming more alike, but significant differences in status and culture still prevail. One of the key findings of the study was the central importance of human resource planning in the "informated" organisation, a point which has been acknowledged in the UK in the recently published Follett and Fielden reports.[2,13]

Conclusions

Drawing the threads together and summing-up current thinking on the knowledge, skills and insights required of future information specialists, we arrive at the following set of attributes. Information specialists must have in-depth subject expertise, as well as broad organisational interests. Expanded technical demands mean that they must be able to cope with basic hardware problems, handle a wide range of software packages, establish network connections and navigational tools, and deal with queries on copyright and related legislation. Their roles of advisor, trainer and facilitator will necessitate instructional/teaching ability and strong oral and written communication skills. Responsibilities for operational management of tailored information provision will entail negotiating with suppliers and conducting cost/benefit analysis of the different options for information delivery (on-site holdings versus remote access, print versus electronic, standalone versus networked, etc.). Above all they must be 'change-positive' and comfortable with chaos, with a personal commitment to their own learning and development throughout their careers.

We are therefore looking at a much wider set of competencies than before, embracing professional and technical knowledge, interpersonal and training skills, and managerial and business insights. There are considerable implications here not just for staff development and training, but for organisational development - the concept of the 'learning organisation' - which will mean real cultural change for many LIS. In this context, Lee argues that we must not only become capable of transforming our institutions in response to changing situations and requirements, we must be able to invent and develop institutions capable of bringing about their own continuing transformation. "To do this, today's managers must develop an understanding of the assumptions, premises, philosophical postulates, intuitive insights, and logic of organizational development."[7]

Managers must develop managers: they must accept responsibility for developing themselves and others; they must act as role models, as well as actively developing their staff. On-the-job learning and regular structured in-house training programmes will be essential, and many libraries (such as

Aston University LIS) are already following the example of shops and other retail outlets by introducing a weekly 'training hour', opening their doors to customers later in the morning to provide at least one hour per week off-the-job training for all staff. LIS managers need to change structures and cultures in order to create a climate in which people can perform.

The boundaries between libraries and other support services will become increasingly blurred; they will shift over time, and may even disappear altogether. Professional education and qualifications are bound to be affected, and are unlikely to survive in their present form. However, we need not see these developments as a threat, rather as a big opportunity to move centre-stage: we have a chance to enhance our role because we have a distinctive contribution to make, but we need to be able to put this message across effectively - and quickly.

If we succeed, then we can really claim to be the 'Information Super-professionals' for the Information Superhighway. Pitkin's scene-setting introduction to the published proceedings of the 1992 Computers in Libraries Conference offered the following characterisation of the future roles of Chief Information Officers - strategic planners, change agents, innovators, business managers, communicators, politicians, resource managers, co-ordinators, integrators, negotiators, and educators.[14] All the evidence available suggests that information specialists at the *operational* level can and must fulfil these roles to provide a quality service. The opportunity to exercise our professional expertise at the corporate *strategic* level thus awaits us, and promises a bright and exciting future.

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Cyberspace, Virtualization, and the Role of Cybrarians

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Abstract

Humankind is creating a new digital realm that will exist parallel to and enmeshed within the physical world. This emergence of cyberspace is a process of virtualization, whereby direct interaction between people and between people and things will increasingly be mediated by the computer. How will this process affect society, the organizations we work for, and our own profession as information intermediaries? What is the role, function and professional aim of a cybrarian, this new breed librarian who does not operate between stacks of books, but in a total electronic environment? Our lecture will attempt to chart some of these changes, based on concrete experiences in building virtual libraries.

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Information Specialists in the Future Academic Library : Flexible Tightrope Walkers

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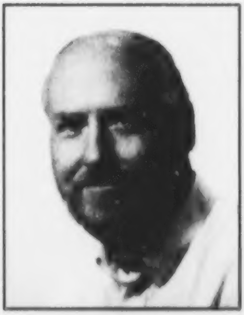

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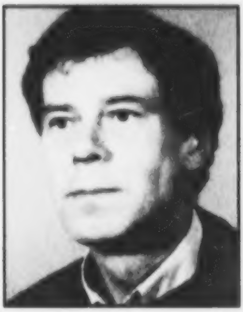

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Abstract

Academic libraries are in the middle of a transition from traditional services to an electronic networked environment.

At present we are facing the situation that access to a huge amount of often redundant information (resources) is achieved by a small

number of non-integrated, often overloaded and confined Network Information Retrieval (NIR) tools. Consequently there is a strong urge to produce order out of this chaos, either by the development of intelligent new generation NIR tools or by the establishment of a rather classical bibliographic control of networked information.

Against this background some possible future roles of academic libraries and information specialists are outlined. Despite the fact that a diversification between positions will take place, the information specialist will be increasingly confronted with additional assignments and requirements. Especially the ability to set up collaboration within local, national and/or international alliances is emphasized; an information specialist should be - among others - a liaison officer, a guide, a trainer or a consultant. Like a tightrope walker the information specialist must steer a middle course between the more traditional and these modern forms of librarianship.

Introduction

At present we are facing an outburst of electronically available information on worldwide accessible and interconnected networks, generally known under the generic term Internet. Although information specialists were familiar with the concepts of networks, interconnectivity and electronically accessible information, the speed and momentum of the present developments measured either by:

- the number of interconnected networks;
- the number of computer systems attached to these networks;
- the amount and diversity of the information resources on these computer systems;
- the number of information providers and end users of that information or, last but not least,
- the exponential growth rate of each of these parameters

were generally not foreseen.

All participants in the traditional information circuit, in particular: author - peer reviewer - publisher - information provider - intermediary - end user, are faced with this fast revolution and are forced to reflect on their traditional roles and positions. Not every revolution will change things for the better, but information specialists are in the middle of it and they have the options to either ignore this phenomenon or to take the opportunity and shape it wherever possible.

After a characterization of the present situation, partly based on our personal experiences within an academic library setting, we will outline some roles academic libraries could play on a short and medium-term basis and consequently the role of the information specialist in the foreseeable future.

Long-term effects and social aspects will not be discussed. Futuristic scenarios dealing with the impact of the information superhighway on the politics and the organization of our society are often far-reaching and hard to judge at present on their sense of reality.

Characterization of the Present Situation

A sketch of the present situation requires a closer look at the following factors:

- information (resources);
- access to and organization of information (resources);
- patrons and end users;
- intermediary organizations (in particular academic libraries).

Information (Resources)

When information is defined as recorded human thoughts, being either the result of purely thinking or the reflection of thoughts combined with perception, we observe:

- an exponential growth of the science-tree. After the initial development of branches in the natural sciences a few hundred years ago, we are now facing a situation that the lifetime of each new shoot, in other words a new specialization of a subdiscipline of a science, is currently about 5 years. During that time this specialization has generated either new shoots or is dormant.[1]
- faster and cheaper publishing facilities (particularly notable in the production of grey and black literature).
- a boost in the mobility of information (carriers) and consequently an increased consumerability of that information. As is known from the

evolution of printing techniques during the beginning of the 16th century ("the first information boom"): consumption of information leads to new information.

- due to the synergism of these factors an explosive growth of the quantity of information and information resources attached to the Internet, such as: databases, OPACs, bulletin board systems, ftp servers (among other things text and software archives), university information systems, electronic journals and newsletters, telephone directories and the like.

As a direct effect of this information explosion and of its mobility, we observe a lack of clarity with respect to:

- the possibility to judge the relevance or the scientific value of accessible information (whether or not peer reviewed).
- the determination of the actual location and/or contents, the authenticity or even the mere existence of a given resource.

To make things even more complex, we also see a divergence in how information is recorded and therefore an increasing variety in the nature of available information (text, images, sound, video) and consequently a growing number of revisable and final file storage formats (among other things: SGML, HTML, TEX, GIF, TIF).

Access to and Organization of Information (Resources)

Access. During the last two decades the improvement of tools to locate and access information has stimulated the consumption and production of information. With the Internet boom the need became apparent for appropriate mechanisms to support browsing, pinpointing and accessing the many available resources. Many private persons and organizations became involved in the development of software and network applications known as Networked Information Retrieval (NIR) tools.

First generation tools are:

- Simple Mail Transfer Protocol (e-mail);
- File Transfer Protocol;
- Telnet (remote login).

Well-known second generation tools are:

- Gopher;
- World Wide Web;
- Archie Archive server;
- Wide Area Information Server (WAIS);
- X-500 directory service.

Each of these essentially text based tools require one to follow the information provider's concept of how resources are arranged and connected. Despite efforts to provide better integration, there is yet no single point of access for Internet users to begin their journey of exploration, access and use.

Organization. Traditionally, libraries disseminated information by giving it a higher level of abstraction (via annotations, classifications, subject headings, keywords, etc.) and to embed this meta-information in consistent infrastructures. Likewise, this urge to structuralize manifests itself with regard to the new information resources attached to the Net.

Because of the huge amount of textual and visual information, the lack of vocabulary control, and the limitations of the existing NIR tools we see a number of attempts being made to sort out the chaos by combining these tools with the more traditional library skills. A few examples:

- a great number of guides in printed and/or electronic form are available with information about Internet services and their uses;
- numerous subject trees appeared in Gopherspace;
- many subject-oriented resource guides (listings of Internet resources) are available and accessible (e.g. via the Michigan State University's clearinghouse);
- resources are indexed by means of traditional classification schemes (e.g. the Universal Decimal Classification within the BUlletinBoard for Libraries (BUBL) and the Lund University's electronic library project; the Dutch Academic Library Classification within the Royal Dutch Library project).

In a number of cases resource descriptions are indexed via a Wide Area Information Server. Statistics indicate frequent use of these systems; apparently there is a great need for these kinds of services. The users of these systems are facing problems such as redundancy and overloading. The providers of these useful services, however, have another problem, namely: maintenance. There is simply not enough staff to keep up with all these growing, changing and vanishing resources.

In conclusion, access to and organization of information (resources) can be summarized as follows:

- different network information retrieval tools for different functions;
- indexes aiming for worldwide coverage become silted up (Veronica);
- limited retrieval facilities due to the cryptical representation of file names, directory names and menu entries;
- often incomplete and outdated resource guides (attempts to organize are hampered by the lack of staff);

and because of the variety of storage formats:

- limited manipulation facilities of retrieved information.

Patrons and End Users

Patrons, the providers of public funds, enable the libraries to play their typically intermediary role within the information transfer. For many years they could be quite passive and consequently the libraries were fairly free in defining their own levels of service. Due to the recent revolution in the information world, patrons are forced to change this policy of only creating the financial conditions. What we can see now, at least in Europe, is broadly speaking a nervous reaction without much coordination (numerous calls for proposals and tenders). Recently initialized coordinated research in the UK as a result of the Follett report[2], is a good example that it can be quite different.

End users differ widely in their needs, demands and in their ability to cope with the developments in this information era. Among them are experts able to fulfill their information needs and/or able to create even their own WEB or Listservers; some are so experienced that they suffer from an overkill of relevant information, it is as if they are "drinking from fire hoses".[3]

The majority, however, cannot cope with the present situation. The existence of OPACs, CD-ROM databases, online databases and current contents databases was already complicated enough; now there is something like the Internet with an amount of resources almost beyond imagination. They experience the present situation either as a jungle or as a barren desert. All they want is a fair amount of relevant information, fairly cheep, fairly quick and very easy to get, no matter whether this information is provided by a library, a publisher or directly by the producer.

Academic Libraries

Academic libraries are situated at the crossroads between printed information and electronic information, and probably will be there for several years. In this situation, budgets are shrinking, subscription rates rise and special libraries rely more and more on the traditional services of academic libraries. Partly due to these circumstances such services are rationalized and at the same time we are moving into an electronic networked environment. To cope with this, the internal organization is redefined, committees and task forces are set up, additional tasks are inserted into the assignments of library staff until long-term policies and procedures are established. Consequently responsibilities of staff are sometimes blurred and certainly the recruitment of new personnel can be a laborious job; we are often looking for the impossible.[4]

What can be learnt from the present situation we can use to define our future institutional roles?

Future Roles of Academic Libraries

As long as we see the mission of an academic library in the future as the mission it has today, in other words to support teaching and research needs of the university by giving reference service, and if we see reference service as the direct or indirect provision of information independent of format or medium, then we certainly have a role to play within the electronic networked environment.

The previous thumbnail characterization of the present situation reveals a number of challenges and opportunities academic libraries are already involved in or should be concerned with right now. Because of their IT-potential, specialized staff and often close collaboration with the university's computing center, it is not surprising that academic libraries in particular have taken up the gauntlet.

What can be done? We can:

- promote, educate and train library staff, end users and patrons in networked services;

- mount locally important collections on a Local Area Network (LAN) or even a Wide Area Network (WAN);
- organize networked information within a CWIS and/or within transparent national or institutional library networks (e.g. in projects as EURILIA and CALIBRE);
- be(come) a banker of information;
- organize (remote) reference;
- participate in establishing bibliographic control of networked information;
- encourage scientists to develop multimedia material and to organize access to that information;
- start up a dialogue with publishers on issues such as copyright and (refereed) electronic publishing;
- develop electronic document delivery services (as is done in the authors' library with Engineering Information in the Article Express project);
- participate in the development of an integrated workstation;
- participate in the development of a limited number of top-level NIR tools;
- participate or initiate ....

The opportune moment is there. Never in history has there been so much interest in electronic information (exchange) as in the last couple of years. Because of the undivided attention the mass media pays to the electronic superhighway, we are now experiencing a global advertising campaign, free of charge, for electronically available information.

Within a couple of months both IBM and Royal Dutch Telecom will become important Internet providers in the Netherlands; expectations are that private enterprise in particular will respond.

A lot can be gained in terms of increased awareness of scientific information. In that sense the Internet phenomenon acts like a catalyst and we must not miss that chance.

The challenges are there and the moment is there, so the question is not whether we should be involved in the integration of electronic products and services into our libraries, but rather where we want/or are forced to be involved in and to what extent. We do not have the means nor the skills to fulfill all the needs and wishes by ourselves. Despite the fact and perhaps because of the fact that we are in the middle of a transitional stage with its demands on available human resources, because budgets are not flourishing and because there is, generally speaking, no structured support from patrons, we have to work bottom up and, most importantly, we have to head towards strategic alliances; from now on cooperation is the magic word.

Furthermore, we cannot afford to wait for clients, we must approach them, find out what they want and how they want it; we have to develop a marketing strategy (at the DUTL, for instance, firms of consulting engineers are defined as an important external target group) and we have to promote ourselves. As for promotion, Internet is and will increasingly be a very important medium.

Finally we will focus on what must be done or in all fairness should be done within these bottom up approaches and strategic alliances in the short and medium term, and this is where the information specialist comes into the spotlight.

Future Roles of Information Specialists

In this section we will outline some future roles of information specialists by focusing on a couple of items mentioned before.

Promotion and education. We have the obligation to give reference independent of format and medium, so the information specialist (who else?) is compelled to know the tools and regarding his/her specialism to have a fair idea what is on the Net and what is not. Therefore he/she has to be trained and once trained he/she can train others.

Education and training can be organized in many ways (e.g. computer based), for different target groups, within different modules, each with its own curriculum. In Delft six modules are operational at the moment for university staff and students and for external clients. In this case collaboration with the university's computing center is desirable; at least tuning should takeplace. Spin-off: direct revenue, promotion and awareness of modern library services.

Networking databases. In this era of networked information providing access to databases (either owned or purchased) via stand alone systems is becoming almost obsolete for academic libraries. Today this information should at least be accessible via the library's Local Area Network, but in fact there should be campus wide access via the university's Wide Area Network.

Of course there will be technical problems due to the fact that: a variety of databases based on specific operating systems (DOS, UNIX (HP, SUN), VMS (DEC), MVS (IBM)), have to be made accessible for a range of workstations (PCs, UNIX workstations, Apple Macintosh, VT100 and 3270 terminals), using a variety of network protocols (TCP/IP, IPX(NOVELL), SNA(IBM)).

Although the further development of client-server systems will increase interconnectivity, these problems should not be underestimated as many of us have experienced from nearby.

In Delft we presently have the OPAC and the Current Contents Database of ISI available on the university's WAN; before the end of the year approximately 35 CD-ROM databases (now available on the library's LAN) will follow.

The information specialist comes into the picture for the necessary fieldwork within the university, for dealing with organizational aspects and, knowing his customers, should at least act as a sounding board for the composition of the functional specifications. Here close cooperation with the university's computing center is a must. Spin-off: an increased level of reference, promotion and revenues (increased document delivery).

Organizing networked information within a CWIS. The next step should be the organization and presentation of information via the Campus Wide Information System (CWIS) that is connected to the Internet. Moving towards that direction opens a wealth of opportunities to support potential customers from all over the world. What can be done?

- Presentation of locally important collections in an orderly way and access provision by remote login;
- promotion of the library's services and policy. Goodbye to the numerous leaflets with information that nobody reads once collected and that is lost when needed. People like to access information wherever they are and whenever they want it;
- promotion of mailboxes for different purposes;
- placing signposts to information located elsewhere and of interest for the university's community;

- facilitating centralized access to faculty ftp-sites or becoming a banker of certain parts of that information by mounting it on a document server of the library, and there are certainly numerous other options.

In Delft we have had a Gopher-server operational for a few months now; a WEB-server will follow in the first half of '95. There will be technical problems; especially providing remote login into DOS-based systems and the issue of access restriction for certain areas (as a consequence of license agreements and legal constraints) have to be solved, but the main item of consideration here is maintenance.

Especially if the information is stored on a WEB-server instead of a Gopher-server and when menu-items and large textual parts are presented bilingually (something our Anglo-American colleagues do not have to worry about), updating could be quite a burden, although several maintenance and conversion tools are now under construction to facilitate these tasks. Nevertheless, the size of the menu-tree and the maintenance capacity should be in balance.

Needless to say that the information specialist comes fully into the picture here, him/her being familiar with the library's services, being an organizer of information, an explorer of and signpost to resources and perhaps above all being a liaison officer between the library and the university. Collaboration with the academic community and with the university's computing center is a must.

Spin-off: again an increased level of reference, increased promotional effects and perhaps even a further increase in document delivery.

Organize remote reference. By providing more and more decentralized access to information, the demand for real-time reference services is growing. Examples of real-time interactive communication already exist on the Net in the form of a multiuser text-based environment.[5] These systems resemble the text adventure games that were so popular in the mid-1980s. In Delft we are now conducting a feasibility study with regard to the implementation of a multiuser online object-oriented (MOO) environment within our Gopher-server.

Establishing bibliographic control over networked information. After, to a certain extent, order has been produced out of our own chaos we arrive at the last item we would like to emphasize: "Establishing bibliographic control over networked information out on the Internet" by means of building resource guides.[6] At this moment there is undoubted a need for "taming the beast" in that sense.

However, a lot of research is going on at the moment into the development of third and even perhaps fourth generation retrieval tools that integrate features of existing ones and which can or soon will be able to understand semantics as well as syntax. We hear about intelligent agents such as robots and spiders cruising the Internet for perhaps several days, searching for appropriate information within full text databases. So it is legitimate to ask ourselves whether in the future there will be a need for well-ordered subsets of some kind within the Internet; powerful intelligent retrieval tools could do the work for us.

Even when these tools are operational in the near future, we think it is plausible that the organization and establishment of bibliographic control of (Internet) resources will be highly desirable, because it is becoming more and more apparent that the Internet provides too many relevant resources. Therefore it will be increasingly important to provide the user with an idea of the content, the level of reference and the quality of these resources. Building descriptive resource guides simultaneously containing meta-information about these resources can be of great help. Aiming for a universally consistent infrastructure of meta-information for every specialization of a subdiscipline of a science is of course a utopia and not even desirable. Every indexing system acts as a lens and every lens reveals another part of the entirety.

In this scenario the information specialist can and must play a vigorous role: there will be a shift from the more or less detailed indexing of the library's own collection to the description (or perhaps even the organization of these descriptions) of virtual resources on the Net. Collaboration with the academic community, students as well as academics (because they can offer a unique combination of novice perspective and subject expertise), as well as with remote specialists and information centers is of crucial importance here; we are really forced to head for national and international alliances. Spin-off: increased level of reference and promotional effects as a result of an enthused interaction with university staff and students. Revenues can hardly be expressed in terms of cash but all the more in the appreciation and the justification of the library's important role as an information intermediary.

Conclusion

The future role of the information specialist within the networked environment will be partly defined by the level of involvement of his/her organization with respect to the integration and expansion of electronic products and services. A number of libraries can and will play an initiating role; to what extent they will succeed depends largely on their ability to:

- develop a long-term policy plan;
- cluster know-how;
- acquire necessary resources; and, last but not least,
- adapt their organization.

Within this uncertain process of change, the information specialist plays an important role, but it will not be an easy one. Despite the fact that a diversification between positions will take place, he/she will be confronted with additional assignments and requirements. Especially proper knowledge of technological aspects is essential here. Under the present conditions he/she, like a tightrope walker, must steer a middle course between the more traditional and modern forms of librarianship and must change from an introvert person solely indexing collected items and waiting for clients to an extravert person able to initiate collaboration and services and able to promote these services. The information specialist of tomorrow must be:

- an organizer;
- a liaison officer;
- an initiator and foreman of small-scale projects;
- an information scientist (able to evaluate existing retrieval/modification tools and to write functional specifications for new tools);
- a guide at the Internet gate;
- a Network Miner[**] (an explorer of interesting information resources);
- acquainted with a fair number of known and relevant resources;
- a driver for people not able to or not willing to transport themselves in information space;
- a trainer for users not able yet, but willing to make their own tour.

Indeed a flexible person.

[**] as is the official title of one of the ICE (Internet Connections for Engineering) project members at Cornell University

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Have Librarians Failed Librarianship? A Reply to Lancaster

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Abstract

Frederick Wilfrid Lancaster's 1991 article, "Has Technology Failed us?", presented at the 13th International Essen Symposium outlines the failure of "information technology" to bring improvements in significant areas of library operation, particularly subject access. The consequences of failure are far-reaching, and if Lancaster is correct, then libraries and librarianship may be at risk. Indeed, has Lancaster gone far enough in raising the alarm? Or is it librarians that have failed librarianship?

Lancaster argues that librarians have too closely allied themselves with the interests of technology. The responses of thoughtful librarians suggest that the path to the library-less future may be a rocky one. The electronic record may be far less stable than the

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print record and the impediments to gaining access to it more significant than have been foreseen.

Whether librarians are able to preserve their proclaimed role as protectors of the cultural record in the world of the electronic text and their identity as a profession is an open question, and they may have already lost the contest. This paper builds upon Lancaster's essay, assesses librarianship's successes and failures in meeting the technological challenge, and places those successes and failures in the context of current thinking about the adaptation of professions to change.

Introduction

The 17th International Essen Symposium is devoted to the evocative and powerful metaphor of an "Information Superhighway." Ahmed Helal invites us to consider the roles of librarians and information scientists in an emerging, (neo)-technological world. But the "information highway" itself takes meaning within the greater context of an emerging "information society," one in which knowledge changes every 5 1/2 years (or 7 years, or 8 years, depending on the source), and in which the "knowledge of the work force" is the only resource we have.[1] U. S. President Bill Clinton's administration has placed management of the "information society" as one of its highest priorities, and a Chicago *Tribune* article reports that "Information, in the form of new technology and new ways of making the things we buy, is the new frontier for a nation that often wonders whether it has a frontier anymore."[2] What people mean by the word "information" has become fluid. Henry Duignan sells valves in Michigan, but markets "information." "Manufacturing is becoming a services industry. For example, take a piece of steel that comes out of one of those mini-mills today. It's got so much more information in it."[3]

Futurists declare that the good jobs of the next century will be "ones that smart machines cannot yet perform," and advise the young to consider becoming "information brokers." To become an information broker, students should get graduate degrees in information science, "with a specialty in indexing hypertext."[4] The consequences of failure are severe: "Failure to do a better job could hurt the economy and rend the social and political fabric."[5]

If the inability to meet the challenges of "information" threatens the survival of the American economy and its democratic institutions, then scores of occupations and cultural institutions are also at risk. Included are libraries and librarians, those that define themselves in terms of their relationship to information - books, journals, computers, and a host of sources that are inescapably part of the information universe. The literature of librarianship is filled with apocalyptic warnings.[6]

Has Technology Failed Us?

In 1990 Wilfrid Lancaster, the educator and scholar whom we honor this week, read at the 13th International Essen Symposium his provocative paper, "Has Technology Failed Us?"[7] Lancaster concedes that the achievements of technology have been impressive, then asks whether technology has "lulled us into a false sense of security - into the belief that our ability to use computers has made us indispensable to the world at large."[8]

Lancaster maintains that librarians have ignored invaluable management information data that has been made available by technology, data that could improve the precision with which we select materials for our collections. More significantly catalogs have grown larger without compensatory increase in their discriminatory power; "...seekers of information find much of what they use from specialized bibliographies or bibliographic references in items already known rather than from databases, library catalogs, or consulting librarians."

> "In our pre-occupation with technology, we may be misled into underestimating the importance of the skilled information professional and the needs and preferences of the users of information services."

He concludes,

> "Yes, technology is still glamorous. But let us not delude ourselves into believing that it has had a substantial impact in improving the services that a library provides to its users, that it has greatly improved the image of the librarian, or that technology alone will increase the perceived value of library and librarian in the future."[9]

Lancaster has been concerned about the identity of the library profession for some time, and his Essen Symposium paper carefully frames librarianship in decidedly counter-technological terms, defining the profession in the skills of its practitioners, not the machines they utilize. In a 1984 article, "Future Librarianship: Preparing for an Unconventional Career," Lancaster calls librarianship the "most institutionalized of professions," observing that there are "library" associations instead of "librarian" associations. In that article Lancaster points out that the profession has concentrated on "a physical facilty - a building that houses artifacts - rather than on the technical expertise of skilled practitioners, which is surely the most important thing that the profession has to offer." Even though libraries as places are destined to become more like museums and archives and will be bypassed in the search for information sources, there should still be a role for librarians, even if they are "electronic librarians."[10]

In 1984 as 1990, Lancaster's warning was the same: we must not confuse the tool with the application. Librarians, skilled information specialists or information intermediaries, should be a creative force in the information society, communicators who "teach people how to select sources, how to access them, and how to exploit them." [11]

Four years later we must ask ourselves if Lancaster has gone far enough. Is it not that technology has failed us, but that librarians have failed their profession, have failed librarianship, and that they have tied their futures and their fate inextricably to a technology that will destroy them?

The Technological Challenge

In "Future Librarianship" Lancaster foresaw the possibility that libraries "as we know them" will disappear, but the disappearance of libraries as repositories for "print on paper" is not cause for regret, because librarians will still be performing "professional tasks" outside the library, presumably through increasingly comprehensive and accessible online systems and electronic databases. But Lancaster thought that it would be a "long time before we can construct vast electronic networks that in response to a narrative request statement can select the most appropriate information source and search it 'transparently' to the user."[12]

Now, however, a non-librarian public doesn't find it at all difficult to conceive of an information age without libraries or information intermediaries. British Telecom research lab director Peter Cochrane has "...a vision of tomorrow's electronic university in which inefficient campuses and libraries will be replaced by friendly electronic networks. The new scheme, he told London's *Independent* newspaper, will help people cope with information overload that currently forces them to spend 80 percent of their time finding information, leaving too little time for decision-making."[13]

Donald N. Langenburg, physicist and chancellor of the University of Maryland recently said, "The library, as we know it, is obsolescent!"[14] In a 1992 address, Langenberg suggested that the time might come when university libraries would measure their advance by the extent to which their collections shrank. The greatest challenge a campus in the future might have would be to decide what to do with its library building.[15]

Already, the array of textual resources available on the Internet is leading to changes in the ways that patients interact with their physicians. Breast cancer patients now use online indexing and data on treatments and clinical trials to influence the therapies that physicians prescribe for their disease.[16]

Vartan Gregorian, president of Brown University and the man credited with saving the New York Public Library when he was its president, recently advised American philanthropist Walter Annenberg on worthwhile projects to fund with his millions. Among those projects would be the creation of an electronic reference library of 1,000 titles that would be available to every high school in America.[17] The ready accessibility of such a service to the public, either from its homes, or schools, or libraries, will surely change dramatically the need for telephone reference services like those offered by the New York Public Library and scores of other libraries throughout the country.[18]

With the media announcing technological advances and proposals such as these almost daily, we should not be surprised that many people are forecasting the death of the print library.

The Pitfalls of Information Technology

While many are forecasting the print library's death, other writers have cautioned us against embracing the utopian visions of inexhaustible information that the revolution in computer technology has fueled.[19] Even a recent pull-out section of the *Wall Street Journal* devoted to computer technology contains a column that concludes with the advice, "Just say no. The new is not always better."[20]

Clifford Lynch, director of library automation in the University of California's Office of the President raises important questions that speak not to the technology but to the changes that are associated with its introduction.[21] Lynch has no doubt that libraries will continue, but his concerns address the transformation of cultural assumptions about the textual world as it emerges in the electronic age.

These include concerns

1. about the trend toward licensing of information sources and the "willingness of rightsholders to offer the materials for license at reasonable rates",
2. for narrowcasting and micropublishing, issues associated with identifying where an article was "published" and who may have read it,
3. for the breakdown (or dissolution) of the cultural record, such that libraries "will not be able to capture the shared cultural experience",
4. for establishing "consensus on the compacts of responsible behavior necessary to ensure acceptance of a conversion of the print publication base to electronic format",
5. for the inclination of users to view databases as defining the totality of available information (if it isn't indexed, then it doesn't exist),
6. and, perhaps most importantly, for the responsible management of the [electronic] record, an issue too important to be "sacrificed in the name of economic efficiencies made possible by the networked information environment."

While Lynch's carefully enumerated list of concerns is likely to have reached only a few hundreds of readers, a much more widely circulated challenge to the electronic information environment appeared in the 4 April 1994 *New Yorker*, a weekly news magazine with a circulation of nearly 700,000. In an article titled "Discards" that appeared under the heading "Annals of Scholarship," journalist/novelist Nicholson Baker suggests that the replacement of the card catalog by the online public access catalog may be a very bad thing indeed, and that a very important scholarly resource is being systematically destroyed in the country's great research libraries, largely at the hands of the librarians in whose care they are entrusted. In the event that anyone miss Baker's point, the half-cover headline carried these words, "Catalogue-Card Bonfire: The Trashing of America's Great Libraries."

Baker argues that the card catalog is an historical document that mirrors the intellectual content and development of a specific library collection. Its destruction and replacement by the online public access catalog cannot be viewed as an advance, because the subtle webs and interrelationships carefully crafted by generations of catalogers working in those libraries have been replaced by impersonal, "one-size-fits-all" cataloging imported from an impersonal source far removed from the collections they serve.

How, then, are librarians to respond? On the one hand, they are told that the institutions that define them are, with few exceptions, obsolete. On the other hand, critics chastize them for too eagerly embracing information technology.

The Profession's Response

Library education has chosen to meet the "technological challenge" by redefining the roles of librarians. In these new roles librarians will increasingly take advantage of the possibilities offered by developing information technologies. Lancaster's caveat against confusing the technology with the goal has no seat in these councils. The *Chronicle of Higher Education* recently reported that library schools are overhauling their curricula to reflect the explosion in information technology.[22] The new dean of the University of Michigan's School of Information and Library Studies, Daniel E. Atkins (an electrical engineer) is currently restructuring the learning environment at Michigan's library school. The Kellogg Foundation, a Michigan-based philanthropic institution, has awarded Atkins an astonishingly large grant of $4.3 million to aid that effort. Atkins says, "We don't want to change the core values of the library field, just the way we carry them out.... The challenge is not the next generation of computers, but how to make this incredible but raw technology do what people really want to do."[23]

The American Library Association (ALA), the oldest and largest of American librarian associations, proposes meeting the technological challenge in other ways. In 1993, the ALA published a report, *Project Century 21*, that identified some of the issues facing the library profession. Although it referred to concerns over the closing of library schools and the need to restructure library school education, much of its content, particularly a background document written by Kathleen de la Pena McCook, is shaped by the assumption that the society of the next century will be "a learning society," one in which the needs of citizens for access to information is deemed to be of a very high order. McCook identifies three areas of concern in her overview:

1. Information is a public good. Because librarianship is a profession committed to providing information to the public, it is, consequently, itself a public good;

2. Librarianship's principal mission is to ensure equal access to information to all of the society's members, and
3. Many of the skills and efforts of librarians must be directed toward meeting "end user" needs.

McCook asserts that librarianship is still an evolving profession and that mastery of technology must be subordinated to the goal of providing equal access to all. In contradistinction to Lancaster's observation that the profession has defined itself in terms of the institution, McCook's paper asserts that the new base for librarianship is embodied in the idea of librarians ensuring equal access to information for all. Libraries are secondary. Texts, authors, titles are reduced to an amorphous stew whose base is "information," a stew that librarians will proactively and democratically serve. "The vision writers of our future argue that higher-order skills involving strategic planning, communicating of mission, focusing on philosophical tenets of equal access, and collaborating with external communities will be the hallmarks of leadership in the next century."[24]

Those who accept the assumptions of this document have no choice but to conclude that unless librarians meet the needs of "end users" for information, rich and poor, others will do it for them, and the profession will have reached an evolutionary dead-end. The renewed emphasis on political action, particularly lobbying and legislation, that shapes the identity of librarians in McCook's overview transforms librarianship from its role in the educational enterprise to librarianship militant, a cause that may or may not be able to enlist an army of true believers.[25]

The Professional Context

Librarians and others have debated librarianship's identity as a profession for a long time. If librarianship is not a profession, or even a semi-profession, then the justification for separate schools, accreditation of those schools, and legislation that protects and ensures the privileges of its practitioners are at risk, including the security of career that accompanies professional recognition.

Although the idea of "professions" is an old one, the activities that raise occupations to the status of professions changes continually. Social work has made inroads in areas previously held by counseling and consulting psychologists. Medicine and law are acknowledged to be professions, although they now suffer from problems of image. Nursing and social work have strengthened their relative positions. In spite of varying educational requirements, nurses occupy an increasingly privileged niche in health care practice, even if they are subordinate to physicians in social status. Their subordination may diminish as medicine shifts to emphasize prevention.

Professions have fluid boundaries. Among their identifying characteristics, however, is public acknowledgment that practitioners of professions undergo extensive training, that their practice rests upon a body of esoteric knowledge, often but not always technical and scientific, and that they must be prepared to act in extraordinary circumstances and crisis situations. The closer a profession comes to providing defense against life-threatening situations, the greater its perceived authority. Physicians meet these requirements in their treatment of life-threatening disease, as do criminal lawyers in their defense of defendants against injurious sentences.[26]

The clergy, neither technical nor scientific, retain their professional standing. Their presence is still customary at significant life events: baptism, marriage, and death.

Sociologist William J. Goode wrote one of the most thorough critiques of librarianship as profession in 1961.[27] Over thirty years later, his article still ranks as the most definitive assessment of librarianship's progress toward identity as profession. Goode notes that "librarians have complained that the public does not see the difference between the professional librarian and the non-professional, or clerk, because in the main the book-seeker has direct contact only with the latter." In "Future Librarianship," Lancaster echoes Goode's assessment when he writes, "because many of the activities most visible in libraries are routine and repetitive, the public can hardly be blamed for failing to recognize the librarian as a skilled professional practitioner."[28]

University of Chicago sociologist Andrew Abbott loosely defines professions as "somewhat exclusive groups of individuals applying somewhat abstract knowledge to particular cases."[29] Abbott argues that a more precise definition is not possible, because the word is so important to our culture; it is "at once a form of organization, a level of social deference, an association with knowledge, a way of organizing careers.

Abbott devotes much of his analysis to reviewing the impact of technology on professions, the dimension that is most significantly redefining librarianship today, but he also talks of librarians. Technological advance has brought opportunities for increased specialization. Database searching brought prestige to reference librarians, because suddenly the same resources available to experts were available to librarians. But significantly, technological advances like those affecting reference librarianship, also bring the risk of "commodifying knowledge," that is to say, "Esoteric professional activity can be embodied in commodities, which can then be bought and sold without the involvement of jurisdictional professions....The computer has so hastened the pace of commodification that [indirect forces] may turn negative in the near future, but for the time being, creation of work outweighs destruction."[30]

Goode (and Lancaster) worry that the public sees only the routine and clerical sides of library work, while Abbott implies that librarians, like many other professionals can for a time ride the wave of technological advance. To be sure, medical technology has created a host of new specializations that provide jobs and contribute to the high cost of medical care, and so may information technology create new specializations for librarians. It is an open question whether the public will acknowledge librarians' technological expertise as it has the health professionals.

Nicholson Baker, writing to his audience of 700,000, has a view of librarians that both may reflect the public's conception and help create it when he writes,

> "[Librarians] believe that if they are unburdened of all that soiled cardboard, they will be able to define themselves as Brokers of Information and Off-Site Hyptertextual Retrievalists instead of a shy, bookish people with due-date stamps and wooden drawers to hold the nickel-and-dime overdue fines, with Read-to-Your- Child posters over their heads and February-Is-Black-History-Month bookmarks at their fingertips."[31]

So the future of librarianship hangs in the balance. Technology may bring new opportunities, and commodification of information may eliminate them. Librarians may redefine themselves in ways that bridge the gap between paper and electronic texts, they may redefine themselves entirely in terms of the new technology, or they may become isolated as defenders of a paper universe that in time will vanish. What do scholars who work intensively in libraries have to say about librarians?

What Humanists Have to Tell Librarians About Librarianship

Since 1987, my colleague Stephen E. Wiberley, Jr., and I have conducted a series of interviews with 34 fellows in the Humanities Institute at the University of Illinois at Chicago. These interviews have shown that humanists "consult a librarian" only for certain kinds of advice, although that advice can occasionally be of great value to them.[12]

Admittedly, humanists are only one of many populations that make use of libraries. However, the experience of humanists is of special interest, because humanists' engagement with textual materials is thorough and takes place much of the time in libraries and archives.

Our interviews confirm that libraries are indispensable resources for humanists. The majority of searching they do in library catalogs is primarily for known-items. UIC humanists, scholars in mid-career, themselves are expert, and by the time they have become fellows, they have usually published at least one book and are using their fellowship to write another. Their knowledge of primary and secondary sources is extensive, and their information-seeking is shaped by a framework of memory, personal contacts, and reading that has developed over a period of many years. Their greatest source of citations is from bibliographies and footnotes that they have discovered in their current reading. They also have a network of friends and colleagues who know their interests and who tell them about publications of which they should be aware.

Humanists scan a limited number of journals and association publications, and from specialized newsletters they often learn of people who are working in areas close to their own. They will use scholarly bibliographies when available. They review publishers' catalogs for new monographs, and, following Lancaster's dictum that those wanting the best things to read on a topic should ask an expert, they will contact other knowledgeable scholars for information and advice. Although they are becoming aware of opportunities for communicating by electronic mail, the use of e-mail is still limited. As one fellow said to us, "The computer will never be more important than the telephone for the anthropologist."

Although UIC fellows seldom conduct subject searches in library catalogs, some mentioned their interest in discovering classification numbers for their topics. Once the classification is determined, they will go to the library shelves to sort through the library's collection. An anthropologist whose excavations are in Europe scans the shelves for anthropology titles whenever he is in the library. Another scholar whose training was in American studies learned from a librarian how to do online shelf list searches in the statewide resource sharing system, evidently very pleased to have a union catalog approach to his topic. A second anthropologist who conducts excavations in the United States told us that the literature on American Indians was widely scattered in the LC classification schedule, but he searches various permutations in the catalog (e.g. U. S. Indians - California) until he finds the right classification, then begins his scanning of the shelves.

Were there librarians that fellows thought "expert?" Two fellows praised the work of a librarian in the government publications department. This librarian assisted one of the fellows in finding sources he hadn't known existed. A librarian specially assigned by the library to help fellows was frequently mentioned by them as having been of great assistance. Another fellow said that she evaluated librarians by whether they knew more than she did herself about sources related to her research, eighteenth century women's debating societies.

Several fellows said that a librarian at the Newberry Library, a Chicago research library having outstanding collections in the humanities, was extraordinarily knowledgeable. One fellow told us that the librarian had shown unusual interest in her research topic, advising her of eighteenth century French dramas that she needed to consult. Fellows also credited subject bibliographers at Chicago area research libraries with helping them obtain publications that they needed.

In spite of the generally positive view of librarians' helpfulness and the occasional acknowledgment that there are some who have comprehensive knowledge of bibliography and collections, no scholar spoke of discussing a research topic with a librarian in the expectation that the librarian could make meaningful suggestions about the research topic itself. One fellow, favorably describing the helpfulness of librarians at another institution, still termed them "failed scholars," people who had intended to pursue an academic career but who had had to settle for something less. Fellows viewed librarians as "keepers" of books, whose principal strengths were as technicians, only occasionally skilled and sometimes able to aid scholars.

The Powerful Idea

Libraries figure significantly in history and literature, yet there is no commonly accepted definition for them. Like the idea of professions, it will not do to define them too precisely. Libraries are metaphors for the accumulated wisdom of humankind, the material evidence of our intellectual history. Jorge Luis Borges begins his fantastic story, "The Library of Babel," with the words, "The Universe (which others call the Library)...."[33]

The public believes that libraries are important, even as it may believe that the librarians who keep libraries open and running are only managers, possibly necessary, but replaceable. Our society continues to build magnificent buildings to house libraries, symbols of both material and intellectual wealth. We reveal our devotion to the idea of libraries when we coin expressions like "virtual electronic library," to represent entirely new creations.

Umberto Eco places a medieval library (with more similarities to the research libraries of our time than to those of 14th century Europe) at the center of *The Name of the Rose*, his novel of suspense and murder, and he writes wittily about his experiences in libraries in his essay, "De Bibliotheca."[34] For Eco, libraries are places of discovery and concealment, not only of texts but of bodies (as he playfully suggests in "De Bibliotheca"). Libraries are places where manuscripts (and ideas) may be lost, then found; they are key sites for the transmission of knowledge. We know that in libraries manuscripts have been rediscovered after decades or centuries of loss. We also know that libraries are places where ideas have also been lost, then refound.

In 1948 Kenneth Arrow answered the question of whether majority voting leads to a single ordering, later discovering that J. C. de Borda formulated an answer in 1781 and Condorcet, in 1785. Mary Douglas takes up the issue of why ideas may be forgotten, sometimes for a very long time, then remembered, in her book, *How Institutions Think*.[35] We are not surprised at such accounts of forgetting and remembering, but we may wonder why librarians are not included in them more often. Library educator and theorist Don Swanson has shown that libraries can be sources of public, but undiscovered, knowledge about the world.[36] However, Swanson argues that information retrieval must be forever open-ended, that we can never be confident in any given search that we have found all relevant information.

In the world of print libraries there is one physical location for a text, so the method of ordering texts on the shelves in ways that facilitate retrieval is critically important. For centuries librarians have used classification as a means of retrieval, aided by the capacious memories and mnemonic systems of recall of medieval scholars. Classification represents a particular way of organizing the world. The Library of Congress draws its system from Thomas Jefferson, who in turn, organized the books of his library according to principles developed by Francis Bacon. Melvil Dewey's system is based on ten classes and ten subdivisions. Both classifications and others like them have features that aid memory. The seven liberal arts belong to a system of classification drawn from antiquity, and they live on in the curricula of colleges and universities throughout the world. The stability of classification also carries unavoidable limitations of time and place. The Austro-Hungarian Empire continues a ghostly existence in Library of Congress classification.[17]

We adjust for the limitations of classification by indexing, modifying and enriching the indexing vocabulary as new expressions are coined, as new meanings and institutions emerge. Online public access catalogs permit us to change indexing terms quickly and thoroughly, and these changes no doubt do improve retrieval. But Lancaster tells us that the "transformation of the card catalog into an online database has not significantly improved subject access," and there has been no "significant compensating increase" in the "discriminating power" of the larger, merged catalogs that technology has made possible.[18]

Now, just as librarians have created this elaborate electronic edifice, another problem has emerged to confound access further. Our society has begun to conceive of texts and authors in new and transformed ways. Gerald Graff in his "Confessions of a Research Scholar" understands this development and its implications for libraries very well:

> "...something has happened to the once confidently positivist world of fact and information that legitimated that neat array of fields. It strikes me that the unit of inquiry in the humanities may have ceased to be the isolated fact or discrete text, that we have started to think of inquiry as a business not of piling up facts so much as intervening in a disciplinary or interdisciplinary conversation. Which is to say, we now tend to think of inquiry as a social practice, something more akin to rhetoric than to adding a new building block to a progressively accumulating pyramid of knowledge. If this is correct, then librarians are unlikely to make themselves more helpful to scholars by finding some better way of packaging and organizing the materials of knowledge. The positivist mode of packaging and organizing knowledge has outlived its usefulness, but it would be a mistake to try and find some better equivalent for it."[19]

There is no mistaking that Graff, also, is telling us that we have gone as far as we can in developing retrieval systems. We shouldn't abandon them, but the import for librarians is clear: Graff suggests that librarians find a new identity for themselves by fostering the development of community in universities.

Have Librarians Failed Librarianship?

Lancaster has asked if technology has failed us, and I have asked if librarians have failed librarianship. I do not know that they have, but I am fearful that they will. The changes in libraries, virtual and print, go beyond the question of the format in which texts will be represented to something deeper, more elemental. The old, positivist world of libraries is dead. The consequence is that librarians must determine what it is they need to know if they are to survive as a profession, not an occupation. We have seen that libraries represent powerful ideas, and the conclusion from our interviews with scholars is that libraries, if not librarians, are indispensable to them. Eco placed the secret of the organization of his great monastery library at the heart of his mystery. Only the evil librarian Jorge of Burgos held the key to its system of classification.

In today's world of ostensibly user-friendly systems few of the library's publics believe that there is such a barrier between themselves and library collections. Whatever the limitations, most libraries provide the motivated user some means of access to their contents. One of the most important is some form of subject classification. Humanists make use of classification when it is available, even though they may not recognize that it is only one way of organizing the world. Classification puts knowledge classes in a relational order, one that has changed slowly over time. Classification is an ordering that changes slowly over time and that attempts to mirror the natural ordering of the world. It provides an alternative to vocabularies that have meanings that "drift" over time, sometimes very short periods of time.

Systems of classification appear to offer durability and stability. Today's widely-used systems have taken generations to develop. Their great strength is that they have permitted scholars and laypeople the opportunity of learning how to use them on their own, first by browsing the stacks and more recently by scrolling computer screens.

Now we stand on the brink of another era in the unfolding history of textual storage and retrieval. Librarians, more than ever, need to turn their attention to furthering the understanding of how knowledge is lost and found, of how texts, documents, books are to be ordered and reordered, how to use classification to join and divide. Other systems of classification may have to be brought into use, systems flexible enough to accommodate the ambiguity of postmodern society. The vocabularies of scholarship and discourse continue to grow, divide, and branch. Knowledge will also grow, divide, and branch, and systems of classification must reflect that growth. If, as Graff suggests, scholarly work in the future is to consist of assembling complex arguments, then librarians must also extend their knowledge of classification to storage and retrieval of complex arguments, to new vocabularies, concepts, and points of view.

Library schools once emphasized extensive memorization of bibliographic sources, but this dimension of library education now has given way to facility with technical systems, to giving "students the skills for the Internet."[40] Our society places value in imagination and creative thinking, and professionals are expected to bring the knowledge of their training together with creative thinking in situations where the past is not precedent. No doubt there is still a role for librarians of broad knowledge and depth of recall, especially with respect to storage and retrieval of texts, but professionals do more than remember their classroom texts.

The system of architectural mnemonics of medieval and Renaissance scholars made possible feats of recall that astonish us and were highly prized in their time,[41] and there is no reason that librarians cannot again put such memory systems into use to encompass the widening circle of specialized, multicultural, and complex arguments and the texts that contain them.

In the postpositivist and postmodernist world, it will not be enough for librarians to know collections alone, nor is it enough to memorize this or that classification schedule. Only knowledge of how classification works, how it has been applied to particular collections, what the contents of those collections are, and what is hidden and revealed by classification offers librarianship a form of knowing that is both practical and not duplicated by other professions.

The atomization, democratization, and digitization of texts, the erosion of the canon, the fluidity of language, and the transformation of the practices of scholarship all point to a world in which access to the scholarly record is at risk; the bibliographic apparatus of retrieval still cannot function at the level of detail required. The replacement and supersession of print records by electronic records in no way minimizes that risk. The tumultuous babble of the Internet only expands and intensifies it.

The old positivist world may be dead, but librarians must continue to act as if it were not. Librarians have to remember that there will always be a world of print that will lie outside the phantom images of the computer screen. Librarians must preserve the conversation between print and computer and the fragmented communities that interact with them. That is what Graff is driving at when he says that librarians should be agents of community in universities.

Philosophers remind us that in making comparisons there are at least as many points of difference as points of sameness between the things compared.[42] A library profession that can store, manage, and retrieve a non-positivistic world of text, a world in which the significance and meaning of words changes continually, may be the only profession that remains to bring together the fragmented communities, both scholarly and general, that follow the decline of the old world of print.

Librarians need to know more than they do. They need to know the difference between information and knowledge. Librarians have sometimes served useful roles in bringing text and user together, but they have not known very much about how knowledge is created, how it is signified, becomes established, overturns the old and becomes the new. Librarians need to know what the concepts are that are enlivening scholarly debate. Without such knowledge, how can they expect to engage in extending the conversation between scholars and text. Librarians need to know why it is important to preserve texts and which texts they should endeavor to preserve. Librarians may know technology if they choose, but technology by itself will not be enough to save librarianship, either in print collections or in their virtual electronic counterparts.

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The Role of Information Intermediaries and the Superhighway : Crucial, Important, Trivial, or Non-Existent?

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Abstract

Politicians have a habit of inventing terminology that is at once exciting and promising, and at the same time vague and nonspecific. The phrase "information superhighway" is such terminology. We have all learned of the wonders of the Autobahn, which allows us to get from place to place and with a minimum of discomfort. Information superhighway suggests a similarly happy scenario.

However, the comparison rapidly disintegrates from that point forward. Travelers enter a highway at their own volition, and precisely because using that highway allows them to get to wherever they want to get, for their own reasons and at their own schedule. If they like, they can ignore every other vehicle on the same road. Passing is easy, and they can always get off.

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Information seekers travel their own highways for the same reasons, to get to some place, and to achieve an ultimate objective for which information is crucial but nevertheless secondary. However, the information superhighway promises no possibility of privacy, and no ability to regulate the traffic interaction with others. What information users already face, and what they will increasingly face, is the problem of tremendous volumes of information - some of it crucial, some of it interesting, most of it irrelevant and annoying. At the same time, the amount of effort that end users will be able and willing to spend on the information process will continue to be very limited, because information remains a means to an end, and not an end in itself. And there are many ends.

Acting as screeners of this information, to make sure that the "good" material gets through and that the irrelevant never bothers the client, will require a new profession of information traffic policeman, individuals who can be respected and trusted. Someone will certainly fill that role. By preparation and experience, it should be librarians, but only if they stop focusing on sheer volume and start concentrating on what the client considers quality.

No one in this audience needs to be persuaded about the growth in information. That growth is demonstrated, and amply documented, both in the amount generated through research, through analysis, and through expository pronouncements, but perhaps even more through the ability, with the aid of technology, to disseminate this information far and wide. Nor do I need to persuade any of you that society has become increasingly aware of the importance of information. Ignorance has never been an acceptable rationale, and certainly it is widely held that it is information power base on which decisions can be made that holds the key to success in the governmental, industrial, and academic sectors.

It is certainly also true that individuals, as they emerge in particular from our school systems, are far more comfortable in using computers, and are becoming literate in understanding how to make them work. In a relatively short twenty years, in my own university's academic program for the education of librarians, we have moved from the assumption that the arriving students knew little if anything, to the realization that while this is still true for some, most of our students not only feel comfortable using computers for what we call computer applications, but also in their application as writing machines. At this point perhaps 75% of the assignments that are turned in to my classes, none of which have to be done on computer printers, are done on computer printers.

However, the fact that individuals are no longer computer phobic and reluctant to use machines as that use is appropriate, does not necessarily mean that being able to sit down at a computer terminal is their greatest aspiration, and the one thing they want to do above all others. Drinking beer might rank higher, and you can use your own imagination to identify other priorities. For most of my students, and for my former students who are now professionals, and indeed for virtually all of my professional colleagues, the computer terminal is now a tool to be used when and as it is appropriate to do so. The emotional hatred and fear has disappeared, but it has not been replaced with a new value system that somehow ranks sitting at a terminal as a virtue in and of itself.

I believe that this pragmatic approach is completely appropriate. Technology is, and must always be, our servant, and never our master. Occasionally, technologists wonder why a certain technology, the elegance and power of which is certainly impressive, is not used to anywhere near the extent to which it appears to the technologists that it ought to be used. The answer is very simple. People use what they want to use, and they ignore what they want to ignore. The process is emotional far more than it is rational, but we always have the ability to justify our own decisions to our own satisfaction. Thus, for example, I continue to use both computers and electric typewriters, and I use the latter almost exclusively for creating papers such as this one. Why? Because the great virtue in having this stored in a computer is the ability to move paragraphs and phrases around, to rewrite and edit online. I don't write that way. I write front to back, and I change very little. Given that, I find a typewriter keyboard much more forgiving for the heavy handed way in which I hammer keys. In other words, for me, for certain applications, the typewriter is easier, faster, and more comfortable. That doesn't make me a luddite or an old barnacle. It simply makes me selfish. I do what works best, and most comfortably for me. I think it is important that all of us who are in the information business remember that our clients will always do what they think is best for them, regardless of what the so-called experts think and say.

I find that thought comfortable, and my recollections go back all the way to hearing a talk by Norbert Wiener, the father of cybernetics. Wiener was asked, perhaps by someone who had just seen the film "2001 - A Space Odyssey", in which a computer kills an astronaut, whether or not we had anything to fear from computers telling us what to do. Wiener was reassuring. He doubted that this could or would happen. However, if he feared that possibility, he would simply pull the plug out of the wall socket. I tell this story largely because I served for six years as a member of the Board of the American Federation of Information Processing Societies (AFIPS). AFIPS included representatives from the computer professionals - the Association of Computing Machinery (ACM), the Institute of Electrical and Electronic Engineers Computer Society (IEEE-CS), and the Data Processing Management Association (DPMA). It also contained representatives from a whole range of user societies - educators, historians, biologists, political scientists, and of course librarians. The key disputes, always argued pleasantly and courteously, centered on whether machines should adapt to people, or people to the efficiency of machines. I also recall virtually my first day as Executive Director of the NASA Scientific and Technical Information Facility, when I found editors trying to work with computer produced data that seemed to me to be very inconveniently arranged. I was assured that this was indeed the case, but that the material had to be arranged in that way. The programmer had told them so. I called the chief programmer, who fortunately reported to me (and there is a lesson in this on who should be whose boss), and told him that I had no interest in discussing programming intricacies. However, I was certainly sure that the information could be reformatted for the convenience of the people who had to use it. It might take more effort, it might even be inconvenient for the system, but it was certainly worth it.

These are old war stories, and I know that we have come a long way in developing what are now called "user-friendly" systems. Then why don't I always find them so friendly? "Invalid instruction" is a rude response made by a human being, it is an even more rude response made by an inanimate object. If that computer doesn't shape up, I may just pull the plug. Am I alone in thinking that the concept of voice mail, in which I am not greeted by a human being but by a series of push button options which can leave me hanging out to dry after I have already invested in making the connection, is for me a degradation of quality, even if perhaps the organization that installed the voice mail system thinks it saves it money? Perhaps it does, but it does so at my expense. Whenever the recorded menu includes the option of speaking to a representative, I always choose that option, because I almost always have more than one question. Don't they know that? Unfortunately, I am punished for daring to demand a human interaction by being forced to wait for 15 minutes while recorded music plays in my ear. Does anyone still want to suggest that this is an improvement?

Unfortunately, I sense a growing hypnotic preference for buzz phrases, and without attempting to be critical of the planners of this conference, certainly information superhighway is a buzz phrase. Just exactly what does it mean? And what does virtual library mean? Are any of us willing to demand that our planners stop talking gibberish and speak to us in plain terminology, or do we simply acknowledge our commitment to these great new virtues, without knowing what we are committing to? As I speak to various groups in the United States, I give them a list of terms that should always be included in all management communications. They are valuable because they sound so expert, and are yet so meaningless. Let me just share a part of that list with you. The terms include: balanced, compatible, functional, integrated, optimal, responsive, synchronous, systematized, total, user-friendly, virtual, forward looking, cost effective, flexible, mobile, needs oriented, broader mission, payoff, quality assurance, value driven and vision. I will offer a special prize to the first person who can use all of these terms in one sentence.

If we can ever dehypnotize ourselves from all of the verbiage which suggests that we are about to be launched into some sort of new and utopian age, perhaps we can recall why it is that individuals want information, assuming that they do want it. They want it so that they can do something else with it. That means, quite clearly, that they want what they think they need, and they don't want what gets in the way of their understanding and using what they really do want. Operations research people have known for some time that the ideal information collection is the one that contains everything I want, and nothing else. Large libraries are harder to use than small libraries, and their only possible virtue is in the assumption that, by being larger, they also contain more of the things I think I want to see. Librarians have seen this phenomenon many times when users take material out of the library to keep in their own offices. They do this, and of course I do it, too, because a library in my office that anticipates most of my questions is the perfect size, and the material is always available. And, of course, as we have worked with selective dissemination of information, SDI profile reactions have also told us this. Some users don't mind the garbage along with the good stuff.

Certainly newspaper readers have developed a great deal of tolerance for information that does not interest them. Other of our clients get very angry when we tell them anything at all that does not interest them. Different people have different reactions, but in general researchers have a greater tolerance than executives and decision makers. Can we design generic systems for the satisfaction of all of these people? Any reference librarian knows better.

However, there is a great danger in concepts of the information superhighway as it is being designed for us. There will be lots of information on our terminals, and it will get there very rapidly. However, the decision of what is transmitted is being left to the disseminator, and his reasons for generating something may not be the same as mine for receiving it. In fact, they are almost certain to be different. The great attraction of the invisible college, for those who were members, was that the information being transmitted was small in amount and important in content, because the quality control mechanism was membership in the invisible college. These were people who thought as we did, and we trusted them. If they betrayed that trust, we simply kicked them out of the club.

The problem of trying to protect ourselves against too much information goes back, in my own personal recollection, more than 30 years, and if getting too much information was a problem then it is certainly a problem now. In the early 1960s my then IBM colleague Hans Peter Luhn proposed a concept which would allow scientists and other researchers to bypass the slow and strangling management approval process and communicate their ideas, research findings, and questions directly by computer to their colleagues in the far-flung international IBM empire. This was, of course, before online access, but the concept of electronic messaging was certainly workable. Management liked the idea, approved it, and it was implemented. Technically, it worked beautifully. However, it failed, and it failed because of people. It quickly became apparent that those with really good new ideas should not put semi-developed concepts into the network. At best they were deluged by questions and visitors that kept them from their work. At worst, their ideas were stolen. On the other hand, many people with absolutely nothing to report proceeded to report that nothing on a regular basis, sometimes daily. Posting messages became an exercise in self-promotion. Can we be sure that anything now dumped into our computer systems has passed some sort of value judgment? Who will impose that test? The originator? Management writers such as Tom Peters understand the problem. Peters has written "A flood of information may be the enemy of intelligence." Are we communicating intelligence, or at least information for a purpose, or are we communicating a flood of information that we measure by the bucket?

I know from my own consulting assignments that library and information systems users are desperately afraid of drowning in information, even as they are afraid they might miss something if they turned off the spigot. As I tell information users in my consulting assignments that we plan to add more databases, for access on their own terminals, I can see terror in their eyes. They are not using what we give them now, simply because their own boss insists that they do something beside just access information. Their bosses want them to create something. Should any of this really be all that strange to us? Surely those of us who distribute material with routing lists know that some users simply cross their name off the list and pass it on, pretending they have read it so as not to offend us. I know I do it all the time with material I get from administrative offices or the school library.

Many librarians I know are still fascinated with the opportunity to provide our users with more information. This process began with the reporting of increased circulation as a virtue rather than an admission that we don't know what to give them so we give them more. Perhaps the simple reporting of the size of a library in terms of holdings, without any analysis of what needs we are meeting, is part of that same generalization. I know that many of our own bosses measure us by the statistics of circulation and holdings, but that is only because we have never given them anything better with which to measure our contribution.

Users, of course, treat a library or information system far differently. To use the term coined before World War I, they balkanize it. There is no library as such, there is only their library. If it contains what they want that is good, if not but it contains 2,000,000 other things, that is hardly a substitute. Nor is it a consolation to be told that we own it but you can't have it, for any of a number of reasons all of which make sense to us but don't matter at all to the client.

Information users, as I suggested earlier, have long learned to protect themselves, and to make the system work for them. They do this by pretending they have read it, or pretending that they don't need it. What they want is not more information, but more useful information out of a pile of certainly no more and hopefully less information. And they certainly don't want to spend any more time on the information process. Nor do they appreciate being told by a machine that they are stupid.

I have no real sense that the designers of the information superhighways, who certainly do understand machines and what they can do, understand people anywhere nearly as well as we do. And yet, even as we do presumably understand the problem and what ought to happen to be able to solve it, we stubbornly cling to obsolete and outmoded concepts. We insist that information users, certainly students but indeed also everyone else, not only ought to do their own information work but that they ought to want to. In doing this, we place a moral value system on the entire process that is totally irrelevant to the issue. I will give you further examples of this, but let me simply state at this point that there are conflicting values between wanting to be teachers, to be moralist preachers, or information professionals who earn their keep and the undying gratitude of others for doing for them what they do badly, and what they don't really want to do in the first place.

It is time for examples. At one major Canadian university at which I have taught, the library embarked on a massive program of faculty end user training, so that the faculty would be able to find what they needed, in their own offices, without the need to come to the library. I understand that many faculty don't want to come to the library, and just perhaps they even enjoy spending at least some time in their own offices (depending perhaps on how comfortable the furniture is), but what makes us think that they really want to have the opportunity to sit at terminals receiving error messages? Certainly, they would like the ability to do specific, direct, and simple item lookups, or even to order a book from the library, but that is very different from a complex and time consuming search the outcome of which is quite problematical.

When there is fear that there is something we don't really know how to do, the preferred reaction is to insist that we don't need to do it. (Don't forget, I teach management). Of close to 1000 faculty members offered the opportunity for end user search training, perhaps 25 responded. Six took the course, the others sent their graduate assistants or their secretaries. And that is the elite group which responded at all. Don't think of them unkindly. They have a lot of things to do for which they will get measured. If necessary, information searching is something about which they can pretend to themselves, and to others.

If there are clear indications of an opportunity and a need, it continues to puzzle me that librarians are so reluctant to assume that role. If I try to assess reference service in an academic library in terms of any sort of a model of number of clients per reference librarian established in a corporate environment, we find that reference service has a very low priority and a low visibility. In public libraries, at least in the United States, reference service is just about the first thing to be eliminated, in the insistence that above all else the doors must be kept open. To do what? And how do these strategies and perceptions of the library as a place for low-key self service relate to the new parameters of rapid and up-to-date information, in huge quantities, brought to us over what is called the information superhighway?

We already have a superhighway of sorts, in the identification of options for acquiring material from other institutions, as their holdings are displayed for us in online systems. That electronic superhighway leads to a rutted two lane dirt road called document delivery. We still talk here in terms of weeks and sometimes months, to deliver what we have identified and located in a fraction of the time. And yet, of course, the chain is only as strong as its weakest link.

In talks at this symposium during earlier years, and in a large number of articles, prominent academic library administrators have described their vision of what is called the virtual library. It involves transferring from the library to the terminal in the user's office direct access to all (or at least much) of the information that is contained in the library. All of that material? And without any filtering? Are we certain that this is what our clients want or prefer? Have we asked them, and described alternatives? Or is this, as I fear, simply an attempt to hide information costs by distributing them to the accounts of end users. The result may well be a greater overall cost, but the library will not be blamed. Is this good for the end user? Is it good for the organization that supports both of us? Is it even good for us, politically? Certainly I know enough about politics to understand it is unwise to give away your power base. Money represents one of the most obvious of power bases. If the end user wants something, is it not wiser as well as cheaper in the overall to have him come to the librarian, who controls the money and makes the decisions?

In my management class I use the example of this proposed virtual library scenario in talking about library unionization. The ultimate power of any union in its negotiation with management is the threat of a strike, and the presumed fear that the withholding of services generates in the minds of those who are being asked to fund us. In a so-called virtual library, with all material deposited directly to the user's terminal, if the librarians go out on strike will anyone even notice?

However, the larger question than the political implications for librarians in their decision of whether they want to be information intermediaries, or simply road sign painters, is still the preference of the end user. There is a growing industrial endeavor which recognizes the need for information intermediaries, and in an article in the British journal The Economist in July 1993 this enterprise was given an intriguing name. It was called *meatware*, and the term can be understood directly, in relation to the other two information service terms, hardware and software. Hardware and software supply us with tools, but those tools suggest that we then use them. For a whole variety of reasons already suggested, some individuals would prefer that somebody else uses those tools as their surrogates. This then is the meatware, the human bodies that complement the hardware and the software. The premise of meatware specialists is so attractive that, according to the journal article, a thriving industry of selling such interpretive services is already in existence. I have talked to users in a number of organizations that have contracts with meatware supplying organizations, and the response is mixed. They certainly appreciate the service, without which they would be lost. At the same time, they wish that the meatware specialists, with whom they communicate via telephone, fax, or e-mail, had a better understanding of what the clients were doing and why they were doing it. This obviously suggests that the far better alternative would be an in house information intermediary. However, that is rarely mentioned in personal conversations unless I bring it up first, and it is not mentioned at all in the article in The Economist. The article implies that meatware specialists are the only alternative to nothing at all. Whatever happened to reference librarians?

Part of an understanding of why this happens comes from a recognition of the business reality that an appearance of economy is more important than economy itself. Thus government leaders point proudly to the fact that there are now 5,000 or 10,000 fewer employees in an agency, and the same justifications are used in the corporate and academic sectors. What is not mentioned is that these 5,000 former employees have now been replaced by service contracts that cost twice as much. The fact that the appearance of economy is sometimes considered more important than economy itself is sometimes encapsulated in the nonsensical yet true statement "we are going to have economy no matter what it costs."

Nevertheless, in all of this playing of games to hide and disguise costs, we should be able to count on the accountants to tell the truth, and I have suggested on many occasions that the financial people are, at least, potentially, the library's greatest allies. Because we should certainly be able to demonstrate, without half trying, that qualified information intermediaries are far more cost effective than any alternative. That requires, first of all, that we speak the truth, and that we demand that others speak the truth. When an organization fervently pledges its commitment to the information superhighway and then cuts its library budget, it is committing the ultimate act of folly. Has anyone mentioned the fact that hooking onto the information superhighway will be very expensive, not only in hardware and software costs, but particularly in end user time commitments? It may be that users will spend so much time becoming informed, given the tremendous amount of information that somebody who thinks it is valuable will now send them electronically, that they will have no time to do anything with what they have learned. I see nothing in the description of technological options that will act as any sort of form of birth control for the information generators and transmitters. The reliance on meatware specialists is one alternative, but it would seem to me that there are better ones already in place.

At last year's conference a vendor described a software package aimed at making the work of doctors searching the National Library of Medicine database easier, and reported glowingly that physicians reported in large numbers that this tool had helped them get exactly what they needed. However, how do they know what they could have had, and whether or not there would have been better alternatives?

When I speak to medical librarians I ask for a show of hands of those who think that doctors perform online searches three times as well, or three times as rapidly, or with only a third the computer access costs. There are no hands raised. I use the concept of three times the quality or three times the economy because it is fairly obvious that, conservatively, doctors earn three times as much as librarians, and their time is therefore three times as valuable. If their own access to databases does not meet that test, then it seems obvious, at least to me, that they shouldn't be wasting time and money doing detailed searches at all. They should be doing what they do best, and allow medical information intermediaries, often still called medical librarians, to do this work. Ah, I am reminded, many doctors do not have access to medical librarians. However, that is an easy problem to solve. All we need is more medical librarians, and we must hook them to physicians through terminal access systems we already have. The result is both an improvement in quality and in cost effectiveness. The problem is that some would rather hide the cost, or pretend it does not exist.

As we move toward implementation of the information superhighway, which largely means an uncontrolled flood of information rolling down on us from the hillside - primarily because nobody has made the generator responsible for what he takes the opportunity to tell me, it is not difficult to predict that application of the system will be imperfect. We already know that the ultimate user will do what is most convenient and most comfortable for him. He always has, and he will continue to. In dealing with information, we are not dealing with exact phenomena that can be measured. Just as the user is free to cross his name off a routing list and pretend that he has read the material, he is free to delete all of his computer messages if he has a headache, or feels particularly swamped. As the users of Hans Peter Luhn's system at IBM learned very quickly, the odds of finding something useful is not in their favor. What they will do then will be totally selfish, and oriented toward their own survival. However, that is not necessarily good for the organization that has paid both his salary, and for the computer access hardware and software.

When I return to my office from having been away for a period of about two weeks, I will find on my e-mail system perhaps 250 messages. They will not be rank ordered in any way, they will be chronological. Of these, I guess that perhaps 10 to 15 will be of significance to me, another 10 to 15 will contain interesting but not crucial tidbits of gossip and speculation. The remaining 90% will be, for me at least, the garbage that somebody else dumped on me, for a variety of reasons about which I can only speculate.

I am probably not ready, as Norbert Wiener suggested, to pull the plug, but I will be sorely tempted. As I move toward a formal retirement in which my value system becomes much more selfish, I may unhook the machine completely. Those who reach me by phone, fax, or letter, must make an effort and pay a price, and perhaps that is a good control process, after all. However, what I would really like is an individual, in whom I had absolute trust (neither a secretary or a meatware specialist 1000 miles away whom I have never met), who will tell me that, based on a complete knowledge of what I am working on and what I care about, he or she has deleted 225 of the 250 messages, and left me with the 25 important ones. That, of course, is what SDI systems have always done. There is nothing new in this.

The development of information intermediaries not only meets a crucial need, it also fits in completely with the shift, as countries develop, from a production and agricultural economy to a service economy. We want people to help us to cope with the flood of information that the hardware and software specialists, because of their brilliance and energy in doing what they do best, are in the process of unleashing on us. We want this intermediation service, we need this intermediation service, and we will be certainly prepared - as a nation, a corporation, a university - to pay for it. Not only because the alternatives are more expensive, but also because they are more uncomfortable. Hardly any talk of mine is complete without a quote from Peter Drucker. "In the provision of a product or service that individuals consider essential to their own value system, cost becomes irrelevant." Both librarians and publishers learned that as early as the 1970s, when studies which Bernard Fry and I undertook for the National Science Foundation showed clearly that the average price of cancelled journals was considerably smaller than the average cost of retained journals. When it comes to a contest between money and value, at least in the professional setting, value will win every time. And certainly we should be pleased at this, but only if we know how to use that piece of knowledge.

If there is going to be a large profession of meatware specialists - of information intermediaries, as I am certain there is going to be, who will these people be? Certainly success here ought to be based on subject understanding, on an understanding of the user and his preference for working, and on an understanding of the technology and the options it presents. However, it requires more than that. It requires political and marketing skills, it requires an ability to talk not about absolute costs but about alternative costs and the implications of various options for the prediction of success of the larger enterprise. Perhaps most of all, it requires the ability to generate confidence in our own skills and our own abilities, and getting others to believe it must start with believing it ourselves. That may be the greatest challenge of all.

Nothing I have said should be taken in any sense to be the suggestion of a luddite attitude. I am neither for nor against technology, because technology is a tool, which is sometimes useful and beneficial, and sometimes not. Certainly the potential for benefit is overwhelming, and indeed it can be argued that without the judicious evaluation of the technological options, and the adapting of those that meet our needs, we will accomplish nothing at all. The question whether we use technology is not germane at this stage.

The question of how we use it, how we manage it and control it, and how we make it serve us, is very much germane.

The hardware and software specialists who design new products and services for us will certainly continue to do a superb job - there are enough of them. At the same time, I think that we can continue to assume that they will deal in the efficiency of the system, and that is measured quantitatively. We, by contrast, are the intermediaries for end users whose interest has always been qualitative, and never quantitative. And that describes our job, and explains why it is so crucial.

MIT - The Distributed Library Initiative : Collaboration, Vision, Prototyping

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Abstract

The MIT Distributed Library Initiative (DLI) is a five-year umbrella program jointly led by the MIT Libraries and MIT Information Systems. The DLI is an inclusive, open program, inviting all who are interested in revolutionizing the delivery of electronic library information. Participants include research centers at MIT, such as the MIT Laboratory for Computer Science and the MIT Center for Educational Computing Initiatives, administrative groups such as the MIT Administrative Computing Effort, intellectual property representation, and operational, informational, and resource staff in the Libraries and Information Systems. The DLI is predicated upon the belief that collaboration requires excellent commu-

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nications, so there has been great emphasis on working together, leveraging the expertise resident in each organization, and creation of cross-organizational, cross-functional teams to accomplish work.

The presentation will address three areas of the DLI: vision, prototyping, and collaboration. Each area has required a new perspective and has involved new concepts and approaches to accomplishments in this dynamic area of electronic library information services.

Introduction

The MIT Distributed Library Initiative (DLI) began in the spring of 1990 as a series of informal and collegial discussions between the MIT Libraries and MIT Information Systems (IS). As these discussions moved beyond a shared understanding of common issues toward a joint commitment to work together, we created a collaborative learning and working environment based on excellent communications, mutual respect for each other's expertise and perspectives, and a realistic world view that we can revolutionize electronic information delivery together, but separately we can accomplish very little.

In this presentation in honor of Frederick Wilfrid Lancaster, his accomplishments, leadership, and vision, the DLI will not be discussed as a model for other institutions, for each campus and organization has its own unique characteristics, atmosphere, and requirements. Rather, the DLI is presented here as a learning experience comprised of process, accomplishments, achievements, failures, risks, techniques, and vision. For MIT, the DLI has been a natural path to progress in the realm of electronic library information delivery. Other paths may be more comfortable for other institutions; the goal here is to share information which may be directly useful or adaptable toward the accomplishment of your organization's goals.

The structure of this presentation is based upon three key areas of the DLI: collaboration, vision, and prototyping. Each of these points is essential to the success of the DLI, and each is dependent upon the other two key areas. Before touching on these concepts, the context and history of DLI at MIT must be understood, because it is the education and research environment at MIT and its distributed computing infrastructure created by Athena that are the foundation of the DLI.

Context and Coherence: the DLI Setting at MIT

MIT's motto, mens et manus "mind and hand", captures the essence of the Institute: active investigation and research into new knowledge that can be applied for the benefit and advancement of society. This dynamic interplay of new frontiers, application of knowledge, and research to create new solutions creates an exciting, challenging, and competitive atmosphere. IS and the Libraries also subscribe to the MIT motto, (mind and hand), which implies leadership in promoting the achievements of society through the transition of theory - mind - to practical applications - hand.

One essence of the MIT community was expressed in 1990 by Paul Gray, then President of the Institute, "we're all here to scratch the same itch, and that is to understand something well."[1] Understanding the dynamics, the issues, and the opportunities of electronic information is the galvanizing reason for these DLI collaborations. In each there exists a mutual respect for the knowledge and perspective of the others and a willingness to listen and to learn - to scratch the itch. The value of the DLI is to be open to success; that is, to be receptive to partnerships or work which may, on the surface, seem distant from the objectives.

Located in Cambridge, Massachusetts, MIT has about 10,000 students, equally divided between undergraduate and graduate studies. MIT has five schools: Architecture and Planning, Engineering, Humanities and Social Science, Sloan School of Management, and Science. In addition there are almost 60 interdisciplinary laboratories and research centers. The total teaching staff numbers more than 2000, approximately 1000 being members of the faculty. Twelve current faculty and staff are Nobel laureates, and sixteen past or present members have received the U.S. National Medal of Science. MIT has a distinguished international name as well; there are worldwide examples of replicas of MIT in countries around the world; for example, the Birla Institute of Technology, India, Berlin Institute of Technology, Weizman Institute in Israel, and others around the globe. Many MIT faculty work collaboratively in the international arena with scientists, engineers, and researchers. The personality of MIT encourages outreach, sharing, understanding, and curiosity.

A wonderful example of the MIT atmosphere is provided by the late Institute Professor, Harold E. "Doc" Edgerton, inventor of stroboscopic photography. Just before his death, Doc Edgerton provided these rules for living:

> Work like hell,
> Tell everyone everything you know
> Close a deal with a handshake
> Have fun

Realizing the DLI in this dynamic, demanding and rewarding community is the responsibility primarily of the MIT Libraries and MIT Information Systems. Together these two organizations have chosen to work together to revolutionize electronic library services at MIT.

MIT Libraries

The MIT Libraries are a distributed library organization. There are five divisional libraries that correspond to the five schools in the Institute. In addition there are six branch libraries for specialized collections and services. The collection contains over two million volumes and subscribes to approximately 20,000 active serials. Naturally, the strengths of the collection are engineering and science. The MIT electronic catalog BARTON contains approximately 700,000 records.

MIT Information Systems

MIT Information Systems (IS) provides services to the extensive computer resources available across campus. IS activities incorporate both administrative and academic computing. Athena is the computing environment for educational purposes, and it provides the structure upon which electronic library services are being built.

Athena and Academic Computing

Much has been written about Athena, a world-class project to explore the effects and uses of computing in the academic life of an institution. What is Athena? "It is a campus-wide networked computer system environment serving the needs of MIT's academic community. Athena has over 600 publicly-accessible workstations distributed around campus in both public and departmental clusters where students and faculty can go 24 hours a day, 365 days a year to do class work, write papers, do personal work, and even play games. ... Athena is structured so that a student may sit down at any Athena workstation on campus, and have access to his or her own customized environment and personal files." In total there are over 1600 workstations in the Athena environment. These are UNIX workstations, running X/windows, and the network communications protocol is TCP/IP. The Athena system architecture is a client/server model; that is, "individual workstations (clients) access (or are supplied with) numerous services from other machines (servers) located elsewhere on the network. Most computations are still handled on the local workstation, but the storage of files and other services are actually delivered from elsewhere on the network - by machines devoted to delivering those services. The client/server model allows centrally-managed services to be concentrated so that a relatively small staff can support the system."[2]

MIT has taken a broad-based, encompassing approach to academic computing. As the electronic age and the age of information bring new challenges and opportunities, the solutions must be innovative as well. These problems intrigue higher education generally and MIT specifically as they invite active responses and exploration.

Providing an important foundation for the DLI is a report by the MIT Committee on Academic Computation for the 1990s and Beyond, "Computing for Education at MIT". The committee was charged by the Provost to provide strategies for the future of academic computing at MIT following the experimental phase of Project Athena. "On June 30, 1991, the Project Athena experiment in academic computing comes to an end. After eight years, academic computing at MIT faces a future of financial self-reliance, perhaps enhanced by new partnerships and collaborations, in the context of a growing worldwide ubiquity and importance of informational technology."[3] The conclusions of the committee provide the underpinnings for the DLI:

> We conclude that academic computing is an essential component of a modern research and teaching university such as MIT - essential not only to maintain the Institute's current standing in education, but also to move it to new, innovative levels of excellence.
>
> Promoting educational excellence through academic computing requires work in three areas. MIT should
>
> - actively encourage and support a suite of carefully targeted "Educational Development Projects," in order to improve the

overall level of teaching and learning to prepare our students for the coming century.

- provide a stable, robust, and widely useful set of computational "Basic Educational Services and Tools" accessible from a carefully chosen set of computer types, over a pervasive network, in order to enhance and encourage both intellectual community and personal productivity among students, faculty, and staff; and
- organize appropriate facilities, support staff, management structures, and mechanisms for assessment and review of academic computing, in order to implement these efforts effectively.[4]

As the concept of the Distributed Library Initiative evolved in the Libraries / Information Systems conversations in 1991, we began to envision the DLI as an integral component of the strategy to accomplish work in these three areas. We further viewed the DLI and electronic library services as a "Basic educational service and tool" which is ubiquitous, which fosters collaborative partnerships, which provides a sense of intellectual community and personal productivity, and which provides the opportunities for new organizational structures and mechanisms to provide services effectively.

An important concept in "Computing for Education at MIT" is coherence. In the report, this concept moves beyond computer architecture and system commonalty. The committee redefines the notion of coherence to focus on a set of basic services that can be used by everyone in the MIT community.

The first two strategies described above should be pursued simultaneously. The first strategy to pursue "is to make network-based Basic Educational Services and Tools accessible throughout the MIT community. The second is to extend technical and staff support to a carefully chosen array of Educational Development Projects, including innovations and experiments throughout the Institute. The two strategies overlap and complement each other, but require somewhat different activities and resources."[5]

Although the DLI has components in each of these strategies, the stronger emphasis is on the Basic Educational Services and Tools. Production quality, coherent, affordable electronic library information is critical to the enrichment of scholarly production and the enhancement of intellectual community.

Basic Educational Services and Tools initially might include on-line teaching assistants, consultants, and help; electronic mail, news, bulletin boards, and discussion facilities; file service and transfer; access to library and other databases; registration and similar services; graphics transfer; video processing; logins to computers at MIT and on national networks; and remote printing.[6]

Since the report was issued in 1991, Athena computing services have become part of MIT Information Systems and comprise the core of academic computing services at the Institute. Building upon the report, the following academic computing directions have been identified:

- Serve many students, rather than few.
- Serve the Core of the MIT curriculum, including General Institute Requirements and large introductory subjects in popular departments, rather than its periphery.
- Seek especially innovative or creative uses of technology, rather than more staid uses.
- Reduce technological inequities among departments, rather than increase them.[7]

The Director of Academic Computing is a member of the IS/Libraries Steering Group for the DLI thus providing linkages to the larger environment of academic computing on campus. Library information is an immediate, visible, and effective direction to help accomplish each priority.

In sum, the DLI has firm grounding in the academic directions and strategies in the Institute. Building upon the foundations already in place, both technological and philosophical, the DLI is ready to deliver the information layer for the entire community.

The DLI and the Customer

As a joint undertaking of the MIT Libraries and MIT Information Systems, the DLI seeks to revolutionize electronic library services. We believe that our scholarly community deserves the quality and content of leading edge electronic information services. In January 1992, the Libraries and Information Systems worked with the MIT Committee on Academic Computing to sponsor a "DLI Day" at MIT. The audience that day consisted of approximately 70 participants from across the MIT: faculty, research staff, graduate students, students, Libraries and Information Systems staff. The day was organized by the MIT Academic Computing Council, MIT Information Systems, and the MIT Libraries, and the purpose was to listen to users as they described their needs and to gather information needed to begin to build a new set of electronic information services. These are some of the needs articulated by our users:

> "I need to manipulate large data sets, such as census data." "We need multi-media capabilities in our courses; I want to be able to develop applications myself and to purchase multi-media curricula materials for the classroom."
>
> "I need the ability to click on a footnote in a document and have the system retrieve it."
>
> "I want an electronic personal library, based on my own selections and on recommendations from librarians who know me and my interests - give me only the good stuff!"
>
> "I want to compose and to receive compound documents, text, images, executable programs."
>
> "I want to be as productive as possible, and I want you to maximize my interactions with needed information."
>
> "I want everything on the network and available to me at my desktop with easy to use client software."

The DLI as Networked Information Layer

The DLI is a collaborative effort stretching across and beyond MIT. We describe the DLI as an umbrella program; that is, an inclusive array of activities with the goal of delivering coherent, affordable, production level and quality library services. The DLI provides the information environment for learning and research, and it delivers the information regardless of time or place. The Athena computing environment at MIT provides a broadly distributed, open infrastructure, a strong foundation upon which to layer electronic library services.

MIT believes that information is the commodity of the future, and the DLI is the primary resource for this commodity. MIT is both a creator and a voracious user of this information commodity. Information is malleable and diffuse, and its distribution is increasingly electronic. Libraries recognize that their future as information servers resides on the network and that this future will require complex collaborative endeavors with other information providers. At MIT the DLI is advantaged because it is being developed upon a state-of-the-art existing, client/server network. The relationship between the Athena carrier and the DLI content is delightfully symbiotic; the increasingly ubiquitous Athena system is the platform for the DLI, and the DLI will add value to the system by providing the information layer for the Institute community.

Information Systems and the Libraries have established three primary goals for the DLI:

- Deliver coherent, affordable electronic library services to patrons.
- Improve automation of library operations.
- Rationalize operation and management of electronic library services.

Coherent services refers to the contextual environment where information is presented to the patron. There is logic and arrangement to the data, and the patron has confidence in the information provider to select the appropriate sources and to permit the patron to use them according to his or her own desires. Affordable may imply the institution's ability to pay for the information as a set of basic services to which the community is entitled or to fee-based services which still remain affordable to the customer. The first goal has focused on three types of materials or services:

- MIT-owned materials, such as the MIT Libraries catalog and other data such as text of MIT Technical Reports, MIT theses, images, etc.;
- Materials from elsewhere such as the catalogs of other libraries accessible over the Internet, and any other data, either public or commercial which is appropriate for the MIT community;
- Patron services such as remote circulation services, interlibrary services, online reference, etc.

The second goal: improve automation of library operations, is a recognition of the critical relationship between management of information and delivery of information. The MIT Libraries requires a new library operations system to perform traditional library data management functions in a complex environment and to grow with the needs of the organization.

The third goal seeks to rationalize the operation and management of electronic library services by distributing responsibilities appropriately across

IS and the Libraries to capitalize on the skills, synergies, and scale in MIT's distributed environment. For example, Information Systems is responsible for maintenance and operation of machines and the MITnet; the Libraries are responsible for the management of electronic library services.

To achieve its goals, the collaborative effort of the DLI focuses on delivering production level and quality services. These products and services of the DLI are part of the basic educational services and tools for the Institute and must be stable, robust, and of production quality. The nature of the DLI and the characteristics of MIT preclude any single system from fulfilling the broad requirements of the DLI. Because we believe that we will develop tools only if there are no appropriate ones, we must build alliances and relationships with vendors, other libraries, and all players in the networked information marketplace.

Finally, in order to maintain our principles of openness and future interoperability, we strive to adopt and adhere to and help develop relevant standards. Those standards may be national standards or MIT standards. For example, we have chosen to become active in the Z39.50, the machine-to-machine information retrieval protocol. This Z39.50 participation in the Z39.50 Implementor's Working Group and the Z39.50 Implementation Testbed is, we believe, enlightened self-interest. Through participation and input into these activities, we contribute nationally, internationally, and we ultimately attain a better implementation locally. There are local standards as well. For example, MIT has licensed a system design methodology called Productivity Plus produced by the DMR Group, Inc. This process gives the computing strategies and new system designs in IS a common language and a set of definable steps to measure progress. The process is not a cookbook; rather it describes the phases in a system development cycle and it defines deliverables or products for each phase:

1. Opportunity evaluation.
2. Preliminary analysis.
3. System architecture.
4. Functional design.
5. System construction.
6. Implementation.

"With Productivity Plus, system owners and development team members work together to produce a set of deliverables that they had previously agreed on. At the end of each phase they decide whether to commit to the next phase."[8] This control, flexibility, and common language has become an important mechanism for our system design process.

DLI History

Early activities that led to the DLI began in the spring of 1990. The MIT Libraries were beginning to investigate new technologies for improved information delivery, and Information Systems was beginning to consider the question of the appropriate information content level in the network system and architecture it had constructed. Prior to the spring of 1990, there had been some communications between the two organizations, but there had been no concerted, shared efforts for collaborative work. James D. Bruce, Vice-President for Information Systems, and Jay K. Lucker, Director of Libraries agreed that the timing, atmosphere, and prospects for the future were propitious for their organizations to cooperate. We agreed to temper expectations and to focus more on our abilities to collaborate than to seek publicity about our work together. The phrase for this low-key approach was "flying below the radar".

Coalition for Networked Information as a Catalyst

The timing of the first MIT Libraries and IS meetings coincided with the creation of the Coalition for Networked Information (CNI), "a joint project of the Association for Research Libraries, CAUSE, and EDUCOM, ... , to promote the creation of and access to information resources in networked environments in order to enrich scholarship and to enhance intellectual productivity."[9] MIT became a charter member of CNI. The Libraries and IS share the annual dues and provide the MIT representatives the CNI Task Force semi-annual meetings.

The first CNI meeting in June 1990 outlined a thematic strategy for discussion in the Coalition:

- Incentives and disincentives in research and education communication
- Architectures of and infrastructures for networked information services
- Information exchange among projects seeking to advance the state of the art

- Environments for testing and evaluating service and product innovations
- Codes, policies, and practices that clarify rights and duties
- Professional and user education for effective access to and management of networked information.

In order to give focus and structure to their discussions, the Libraries and IS agreed that an external focus on these issues would be of great benefit and interest to the group and provide a productive mechanism for the Libraries and IS to begin their collaboration. This focus on common issues was more productive than the more traditional approach of exploring each other's organization, which often leads to unproductive probing, questioning, and judging of each organization. These chosen topics became common ground where each organization has considerable expertise to contribute. The results were a realization of those activities which were of greatest interest to the group and which were felt to be appropriate to MIT at that time. The emphasis at MIT is on action, so investigation into architectures and electronic information were chosen as the active project focus.

Collaboration: Creating Alliances

In California's "Silicon Valley," there is a management phrase that says: "competition is the result of good communication; collaboration is the result of excellent communication." The DLI is based upon collaboration which places constant and stringent demands on communication, openness, shared values and vision, and a commitment to the future.

The core of the DLI is the collaboration between Information Systems and the Libraries. The leadership and tone set by the Vice-President for Information Systems, Professor James D. Bruce, and the Director of Libraries, Jay K. Lucker, is especially suited to the MIT environment. Through the project focus and action orientation of the DLI and the full participation in the DLI at all levels of the two organizations, we have experienced real accomplishments, greater understanding of the issues, and a great sense of teamwork for the complex and challenging issues and services ahead.

Earlier the DLI was described as an umbrella program. This means that it is a broadly inclusive endeavor which seeks to excite contributions from those who may be interested in working with us. Further, it denotes that the DLI does not involve any organizational change; rather the emphasis is on beginning work collaboratively and respecting the rights of each entity to work in its own environment.

The collaborative management of the DLI has evolved over time. The management principles of the DLI are to live in the future, respect each other's expertise and contributions, strive for excellent communications, and remain nimble in a networked world of permeable boundaries and accelerated rates of change. This dynamic structure enables a creative and progressive environment for the DLI which maximizes coordination, allocation of resources, and outreach.

The DLI Steering Committee is composed of the senior staff from Information Systems and the Libraries. It is now a veteran group, having been together for about four years. As it has settled down and internalized the DLI management principles, it became apparent that a coordinating group was needed in order to attend to the day to day progress and to bring back updates and recommendations to steering group. This coordinating committee (DLICC) is composed Libraries, IS, MIT Laboratory for Computer Science, and MIT Intellectual Property Counsel staff and it has been meeting weekly during these previous four years. This group promotes communications, nurtures alliances, and it monitors and manages the various prototyping projects, assesses the resources available and expended, and tries to identify upcoming issues for the Steering Committee. At all points of interaction and progress, the DLI strives to maintain a system of communications linkages and feedback.

There are now several groups which connect the DLI at every level of the Libraries and Information Systems organization. The Electronic Library Development Group (elibdev) is composed of programmers and analysts from IS Distributed Computing and Network Services and Academic Computing Services and Libraries staff from the Libraries Systems Office and from Public Services. This group meets to demonstrate, present, discuss, and plan its work. The Network User Interface Team is composed of Libraries and IS staff and investigates the use, development, integration, and evaluation of network based software clients for library information. There are also ad hoc teams that are formed for specific projects; for example, there is a joint team working together to implement the Elsevier Science Publishing sponsored electronic journal project TULIP.

The DLI works very hard to keep up with research activities at MIT and elsewhere. We believe that the environment is a constantly moving arena and that long-term research ultimately becomes near term production. Beyond the Libraries/IS collaboration, the DLI has input from research centers and laboratories at MIT. Of special note are the contributions of Professor Jerome H. Saltzer in the MIT Laboratory for Computer Science (LCS). For several years he has been interested in the issues of scale and architecture for a large digital library. As he pursues his research project, Library 2000, Professor Saltzer has worked closely with IS and the Libraries, and this has created a rich and dynamic discourse running the gamut from high-end research to production level services. For members of DLICC it has been an enriching experience. The DLI has also established contact with MIT academic departments such as the Materials Science department for the TULIP project and the Humanities department for the Oxford English Dictionary, and from other administrative units of MIT, such as the MIT Press.

The DLI Vision

A galvanizing effort occurred in 1992/93 when we created a vision for the DLI. As our collaborative work moved forward, it became apparent that the efforts could no longer be sustained within the existing budgets of Information Systems and the Libraries and that we needed a coherent vision to describe our work to ourselves, to the Institute, and to other interested parties. In short, we needed a vision to clarify for ourselves and for others the DLI. A distinguishing factor in this effort is that work had already begun in several areas before the effort to create a vision started. In looking back, this worked for us, because we were learning about our vision by doing, by building, by investigating. In addition, the process to write a vision together was an important activity for the Libraries and Information Systems.

The DLI vision process is based upon the structure proposed by James C. Collins and Jerry I. Porras in their article, "Organizational Vision and Visionary Organizations."[10] Collins and Porras describe a framework with two primary components: Guiding Philosophy and Tangible Image. Within each component are two parts. The Guiding Philosophy is composed of "Core Values and Beliefs" and "Purpose"; the Tangible Image is composed of "Mission" and "Vivid Description". The organization's environment, both internal and external, constitutes the mediating ground between Guiding Philosophy and Tangible Image.

The DLI vision was completed in 1993 and has served as a gating criterion for new DLI activities - how well does the proposed activity help us achieve our vision? If the answer is favorable, the proposed activity then may be placed into the prototyping tank for further investigation and work. In addition, the DLI vision has also been instrumental in defining the DLI to our MIT colleagues and to external groups who may be interested in our work:

MIT

Distributed Library Initiative (DLI)
February 1993
MIT Libraries and MIT Information Systems

DEFINITION:

The Distributed Library initiative is a joint undertaking of the Libraries and IS to improve radically electronic library services.

VALUES and BELIEFS:

We believe:

access to information is critical to the education and research mission of MIT.

access to information should be free and unimpeded and not subject to censorship.

the Institute resources available for information delivery should be allocated according to a framework that is broadly accepted and known.

access to information should be ubiquitous, easy, and satisfying.

consumers are the appropriate judges of the value of information.

in cooperation and teamwork in delivering information to the MIT community.

MIT should provide leadership in delivering information.

in respect for individual privacy in access to and delivery of information.

MIT has a special responsibility to disseminate information created at MIT.

PURPOSE:

To enhance the quality of education and research
through continuous improvement of information delivery

MISSION:

MIT will do the best job in higher education of
filling a community's information needs electronically.

VIVID DESCRIPTION - The DLI and MIT in 1998:

The way MIT and its people do research and pursue education will be revolutionized by enriched access to all forms of information at their fingertips. Sitting at a workstation in the classroom or laboratory, in the sorority, or in the airplane, anyone can retrieve, manipulate, interpret, and integrate information into their personal knowledge banks. They can easily move among personal, on-campus, and worldwide resources to find, evaluate, sort, and store information. MIT students, researchers, educators, and administrators, freed from the drudgery of information management, are now better able to work together in putting that information to use in the advancement of humanity.

We provide this diverse access to information through an extensive collaborative effort involving Information Systems and the Libraries. The Libraries remain preeminent in the acquisition and intellectual management of information. Information Systems remains preeminent in the design and implementation of network-based delivery mechanisms. Individually and collaboratively, IS and the Libraries educate the community in the use of information. Most work on the Distributed Library Initiative involves teams comprising the right people from each organization and empowered to gather information, analyze options, and implement their ideas. Overall responsibility for DLI, and especially for managing its complex web of projects and goals, is shared between IS and Libraries.

DLI Prototyping: Conscious Decisions

Now that the DLI collaborative environment and the DLI vision have been described, we must turn then to what has been really been accomplished and describe current and future efforts. On a temporal scale, the DLI concentrates its work in the near term future, taking products and services that are available and working with researchers and developers to move new applications and services into a production environment. The application and inclusion of research is vital at MIT. It indicates a willingness to be a full participant in the academic investigations of the Institute, and to contribute to that dynamic environment. This delicate balance and symbiosis, working collegially and cooperatively is vital to keep the DLI moving forward. We cannot become complacent when a system goes into production, and we must continue to work toward ongoing improvement of existing systems. We call this near term space prototyping.

A key element of the DLI is the understanding and use of the "prototyping tank"; that development space which weaves together the progressive helix of research, development, and operations. Conceptually this area is a large container where many activities and interests could swim together and where critical issues such as scale, sustainability, and integration could be pursued. Both IS and the Libraries are charged by MIT to deliver stable, dependable, and cost-effective services. In assuming this leadership mandate, the DLI has created the prototyping tank as one mechanism to move into the future while remaining rooted in the responsibility to maintain and deliver production services. In addition, IS and the Libraries are providing a campuswide service in supporting the DLI prototyping tank. This has become a space where DLI staff can invite researchers to enter and to explore a level of testing and feedback to determine the large-scale feasibility of their work. This testbed for researchers is a valuable transition space between the laboratory and operational application of the research. The prototyping tank gives a medium grade granularity to the research endeavor and provides real-life, larger scale feedback at a critical juncture in the development process. It is a fluid, protean area that facilitates the transition of products and services from the researchers laboratory to operational, production-quality services that are manageable, scalable, and sustainable. Prototyping projects will normally be converted operational services; this means that a commitment is made to store, grow, and preserve the information and the systems that have been developed. Moving these services into a production operation requires planning, resources, and measurement.

At first glance, prototyping may appear to conflict with our focus on building production level systems; the process, however, of nurturing exploration from research to implementation is one where the DLI has a niche. We support this space where research has progressed far enough to warrant greater investigation for scalability and predictability and for us to evaluate whether the work has a place in our production system. The prototype tank functions as a flexible area between the very open bounds of research and the supportable boundaries of production. It is also possible for us to push a production level operation into the tank so that further research for continuous improvement is possible. A key to the prototyping concept is to manage the expectations of those who swim in the tank; they must understand that this is a system which may change dramatically, which may receive little or no support, and which may be a dead end. Fortunately, the MIT community seems well adapted to this experimental prototyping environment, and the DLI will try to state very clearly when something is in a prototype mode.

On another level, we view library operations as the mediating environment between research and learning. Library collections support the dual nature of scientific inquiry: consolidation and confirmation of existing knowledge, and the creation of new knowledge which supersedes the old. This dynamic between the realms of knowledge creation and knowledge use requires flexible access and manipulation of information.

In our conceptual model, the prototyping tank includes efforts that are not yet ready for prime time as an operational offering of the Libraries and IS, but which are sufficiently stable in their designs that they are approaching production roll-out. The prototyping tank supports the fluid movement between operational activities and research activities equally into and out of the prototyping space. A progressive view of the prototyping space always has the operations and research perspectives.

Guiding principles for the tank include coherence with our vision; that is, how well does the activity serve the electronic information requirements of our community, participation; that is, who is involved in this prototype project and how can we leverage the best result for all concerned, timeliness; that is, how does the activity fit with or compete with other prototypes in the tank, and when will it be ready for analysis, and measurement; that is, how will we know when the activity is ready for operations, or might we decide that it needs additional research or does it need additional cycles in the prototyping tank. These principles have a high degree of interaction with each other and the groups involved in the activities are making continuous adjustments in the tank based upon the feedback from these principles.

Visually, the DLI prototyping tank looks like this:

PRODUCTION SERVICES	PROTOTYPING TANK	RESEARCH ACTIVITIES
Library/IS	DLI	e.g. Library 2000

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PRESENT ——> NEAR TERM ——> FUTURE

Underlying the prototyping tank are several critical characteristics. The tank must balance seemingly contradictory requirements: permeable boundaries and structure. The behaviors in the DLI which enable this balance have two common elements: the shared DLI vision and excellent communications that are the essence of collaboration. Since the beginning of the DLI, we have learned that previously existing boundaries are breaking down because we need a new paradigm in order to prevail in this period of an increasing rate of technological change. Boundaries that had separated the interests of IS and the Libraries, interests of MIT research groups and service organizations, and distinguished between types of information (administrative, academic, text, image, paper, electronic, etc.) are less distinct and changing rapidly. The DLI provides the forum for better understanding of this fluid environment and establishes a better foundation for anticipation of and response to the new challenges that we know await us around the corner.

The structure that helps the DLI move forward is open. The Libraries and IS invite participants into the DLI. The DLI is open to everyone who wishes to collaborate in the effort to deliver electronic library services. Participants include research laboratories such as Library 2000, research centers such as the MIT Center for Educational Computing Initiatives, academic departments such as the MIT Materials Science Department, administrative efforts such as the MIT Publication Services Review Group, commercial publishers such as Elsevier Science Publishing, and library utilities such as OCLC. In endorsing and incorporating activities into the DLI, synergy with the DLI vision is paramount; other requirements include ability to scale into a large, client/server environment, support, openness, and integration with other DLI services.

The "lifeguards" for the prototyping tank are the DLI Coordinating Committee. These lifeguards are responsible for ensuring that all the activities have the resources and safeguards for success. Decision points for the prototyping tank are examined continuously by the DLI coordinating committee. This review of projects includes reports and feedback from groups such as elibdev and an understanding of the resources and mechanism necessary to bring a service into production. Issues such as multi-platform supportability, security, growth, and renewal are factored into the discussion. At the point when a service is ready for production, the DLI Coordinating Committee will bring forward a recommendation to the Steering Committee.

There exists an entire array of questions and issues that must be addressed before bringing a prototyped development into production. IS and the Libraries have made great progress in trying to rationalize these service issues and leveraging the strengths of our organizations. IS is preeminent in network development, support, and maintaining the technological infrastructure that is the critical carrier of information. The Libraries leverage their strengths in the areas of information management, organization, and their close relationship with the community of users.

An example of the prototyping tank from the research end is provided by Professor Saltzer and his Library 2000 research project in the MIT Laboratory for Computer Science. Library 2000 is concerned with understanding the issues related to very large scale information systems in the year 2000 and is working on those architectures using readily available technology. Leveraging the dramatic cost reductions in technology, Library 2000 is testing the hypothesis that the cost of electronic data storage will soon be less than storing those same data in paper form on library shelves. As a research project, Library 2000 is an excellent partner for the DLI. The DLI can benefit immeasurably from the discoveries in Library 2000, and Library 2000 can benefit from the availability of content and scale of the DLI. Temporally, Library 2000 is a comfortable distance in the future for the DLI - far enough into the future to set an ambitious and challenging goal, yet close enough to provide real learning and applications. A specific project within Library 2000 is a US government sponsored Computer-Science Technical Reports Project. As a member of a five campus consortium, MIT is scanning and mounting its technical reports in the fields of computer science and artificial intelligence. The MIT Libraries' involvement consists of investigations into building a production-level scanning operation that is scalable beyond technical reports to include a wide array of library information. In the network environment this project is conducting leading edge work into the issues of building and linking "virtual collections" of information that may reside in distributed repositories.

From the other end of the prototyping tank, TULIP (The University Licensing Program) is a good complementary example. Sponsored by Elsevier Science Publishing, the goal of TULIP is to make available to academic institutions the page images of Elsevier journals in the field of Materials Science. The responsibility of the participating institution is to mount these images for electronic access by its community and to investigate and understand better the usefulness of this electronic delivery and the possible licensing mechanisms for a production delivery system. The structure of the experiment is to provide access to the TULIP citation material, either through a bibliographic searching client (WILLOW, the X window, Z39.50 searching client developed by the University of Washington with the Z39.50 client programming provided by MIT) or through Mosaic. MIT has developed a very fast image browser for the display of the associated TULIP images. In this instance, TULIP is coming from the Library/IS domain into the DLI prototyping tank; it is a near-term investigation that prototypes the feasibility of many services with this structure.

The intersection of interests and common needs in both the Library 2000 effort and TULIP is a dynamic indication of successful prototyping. The TULIP effort needs enormous storage capacity, and the Libraries and IS had few resources to support that need. Library 2000 had storage which it allocated to the TULIP effort in order for that project to get off the ground. Conversely, the TULIP effort led to the development of the image browser and that has had usefulness for the Library 2000 work. Both efforts are based upon similar architectures: citations or full text access that link to the associated page images. The intersection of interests has created an efficient and effective solution in both areas of work.

A third example of prototyping is the new library operations system. The Libraries and IS have just completed the selection of GEAC Computers Inc. to deliver the Libraries new automation system. As part of the agreement, MIT will work with GEAC to develop a client/server version of the GEAC Advance system. In this regard, the prototyping extends beyond MIT to include work with a vendor to produce an operational product that will be of benefit for all libraries and will leverage the expertise and experience of MIT in the client/server environment.

The new library operations system effort must also be highlighted because it represents a risk that failed initially. In 1992/93 MIT selected Horizon, produced by NOTIS Systems, Inc. We agreed to work with NOTIS as a beta test site for this totally new client/server library automation product. In June of 1993 Ameritech, the parent company for NOTIS, announced that it was ending development of Horizon. This meant that MIT had to begin the process again to select a new system, which concluded in the recent selection of GEAC. Following our recovery from the NOTIS announcement, we realized that we had made many good decisions in taking that risk: we had upgraded entirely our technology infrastructure with new machines and network installations; we had developed the capacity to move quickly, make good decisions as we moved forward, and we had gained a greater sense of the environment for testing and leadership in new projects. The fact that we took a risk with a beta product and that it failed ultimately became a healthy process for us and one which has made us a better organization.

The prototyping tank for the MIT Distributed Library Initiative has created a productive and flexible space for the Libraries and IS to make progress together and to demonstrate a willingness and capacity to work with the remarkable research talent available on the MIT campus. The DLI has become an exciting and accessible space for a variety of groups to participate in the creation of new forms and approaches to information delivery at MIT. By supporting the prototyping tank, IS and the Libraries have provided themselves with a valuable and productive environment and simultaneously have provided a needed and appreciated environment for the MIT research community. The prototyping structure promotes the transition between research and applications, thus rewarding researchers who can see the actual use and application of their work. This concept then enables IS and the Libraries to move forward quickly with new information services, providing immediate benefits to the users who are able to use and exploit an information rich environment for the creation of new information and knowledge.

DLI Activities

In addition to the three projects described above, it may be useful to describe briefly other DLI efforts; some are already in production, others are in development, and still others are just beginning.

- OWL - Online With Librarian. Online reference service built upon the Athena Online Consultant service. Became operational in the Spring of 1992. Librarians accept and respond to questions posed to the service.

- FirstSearch. MIT provides campuswide access to OCLC's databases product, FirstSearch. This service has been in operation since 1992. We have developed software that enables login to our subscribed set of databases and that hides the password from the end user. We continue to work with the funding model for FirstSearch, combining a set subscription rate and a per-search charge for seldom-used databases or those which the database creator will not include in the subscription pricing model. Our strategy here is that we prefer to purchase network access to commercially available databases instead of mounting them locally on our campus. We believe that our local support should be focused on MIT generated information such as Technical Reports and MIT theses.

- CWIS. The DLI is participating in the renewal strategy for the MIT Campus-Wide Information System, to replace the text-based TechInfo system implemented in 1989. In addition, the Libraries are mounting CWIS-based Library information and linking it to the top-level MIT resource. These are WWW resources that will link together various MIT based home pages and information.

- Electronic Reserves. The Libraries have begun investigations into scanning and delivering reserve materials electronically. The first focus area is on MIT owned and produced materials such as class notes, examinations, etc.

- MIT Center for Educational Computing Initiatives (CECI). The Center was established to build on work of Project Athena and pursue research into the delivery of electronic materials for educational purposes. The Institute Archives is working with CECI and the MIT Museum on Project Doc, a multimedia educational project devoted to Harold E. "Doc" Edgerton.

- MIT Industrial Liaison Program (ILP). This MIT Office provides a heavily-used communication path between M.I.T. and industry. Their work is to provide MIT-generated information to their member companies. A current project of the ILP is to build an online database of research at MIT. As part of the MIT Publications Services Review Group, the MIT Libraries' Document Services department is working with the ILP to provide distribution of publications to the ILP membership.

- Rotch Visual Collections. As part of the Libraries, the Rotch Visual Collection houses a large and valuable collection of slide images used by the faculty and students in the School of Architecture and Urban Planning. The Libraries have worked with the Center for Educational Computing Initiatives and Information Systems to create digital images of these slides and to deliver them across the network.
- MIT Intellectual Property Counsel. The Counsel position is jointly funded by MIT's Information Systems, Technology Licensing Office, and Office of Sponsored Programs. MIT created this position in 1990 in recognition of the increasing complexity and visibility of intellectual property issues in the electronic environment. The IP counsel is involved in essentially every Institute contractual negotiation. In addition part of her responsibility is to advise the senior officers of the Institute on the full range of intellectual property issues and to educate faculty and students about their rights and responsibilities in this regard.
- MIT Press. The book and journal publishing arm of M.I.T. the Press is working with the Libraries and Information Systems to explore the feasibility of providing its journal materials online to the MIT community. The Libraries are working with the Press on the all-electronic journal, The Chicago Journal of Theoretical Computer Science; this work focuses on innovative marketing and licensing arrangements to academic libraries.
- WILLOW. In collaboration with the University of Washington, MIT has contributed to the development of the X/window bibliographic interface called WILLOW. MIT developed the Z39.50 (machine-to-machine information retrieval protocol) for WILLOW and has deployed WILLOW in the Athena environment. In an agreement with the University of Washington, WILLOW is now freely available to other institutions on the network.
- Image browsing. MIT Information Systems has developed a very fast, efficient image browser that is a critical component of image-based electronic information services. This image browser quickly retrieves page images and enables the user to page through a document quickly and to move to a particular page of the document. In addition to high performance, this browser has

zoom (magnification) capabilities, the ability to move to any page in the document, and print capabilities for either a page or the entire article. This image browser is now available freely from MIT.

DLI Research Issues

As a service and development environment, the DLI has enabled us to articulate and investigate a variety of issues related to electronic scholarly information. In addition to the technical issues which must be addressed, we are also discussing the academic, administrative, legal, and social issues which networked library information presents. To help us approach some of these large, complex issues, the DLI has been working to formulate guiding principles to assist our decision making. In practice this means that the Libraries and Information Systems will leverage what each organization does best and that we will complement the strengths in each organization to change dramatically the delivery of electronic library information here at MIT. We respect the fact that Information Systems is expert in operating and managing computers and networks and that the Libraries are expert in selecting academic information content for MIT. This leads us to the conclusion that Information Systems and the Libraries together can best serve the MIT community and its audience - locally, nationally, and globally.

We believe that as more library information is distributed in electronic form, libraries must create a framework to support this increasing body of valuable and volatile information. As part of the DLI, the Libraries and IS are establishing principles and structures for capacity measurement, management, and renewal of electronic information.

The DLI is committed to providing effective and efficient access to MIT generated scholarship, and we have begun to estimate the yearly academic publishing output of MIT. This output includes MIT Thesis, MIT Technical Reports, Technical Memoranda, and MIT Working Papers. We estimate that MIT generates almost 500,000 pages of valuable research information each year. This output is only text based and does not include visual information such as the slide collection in the Libraries' Rotch Visual Collections. This information is both valuable and difficult to discover and obtain. As we move to make this information available electronically, we must plan for accommodating both the current year's output, conversion of existing paper-based information, and anticipation of an all-electronic publishing stream in the future.

DLI is now investigating the issues related to capacity planning for these increasing amounts of information available in electronic form. Capacity planning includes understanding how to grow the system over time, how to renew and upgrade the system continuously, and how to insure capacity to deliver this every growing amount of information to a large community of active users.

An additional area of work on MIT information is understanding the preservation, legal, and administrative issues related to electronic records. Although most of the DLI focus is on scholarly information, we must also work with, use, and provide access services to MIT administrative information. As that information is increasingly in electronic form, we must solve the problems related to long-term preservation and viability of these records to meet administrative, legal, historical, and scholarly requirements.

The DLI continues to be aware of and to work on organizational issues in this area. We recognize and celebrate the fact that the Libraries and IS have been working together for four years to build a solid foundation of collaboration and sharing of expertise and resources for the electronic delivery of information to MIT. In our collaborations, however, we have recognized that we must address specific issues such as: rationalizing the machine environment; that is, enabling the Libraries to use its expertise in selecting, managing, and delivering information to users, and to enable Information Systems to utilize its expertise in the management of the technology infrastructure of computers and networks; deciding jointly upon the strategic priorities of the DLI and contributing resources to realize these priorities; building accurate and sound financial models to understand the costs involved and the ongoing expenses required to deliver electronic information; and, working with our research partners to advance the state of electronic information at MIT and elsewhere.

While working toward completion of products to provide greater information services, the DLI has also begun to articulate and address a variety of complex technical, legal, and social issues. Clearly many of these are issues extend beyond the DLI to MIT as a whole and to higher education, networking, and society in general. The DLI has proved to be a useful forum for preliminary investigation and clarification of such issues. The DLI then serves to bring these issues to higher levels where they are more properly addressed. For example, we have begun pushing for:

- An MIT Information Policy. This is a policy effort of the highest level involving senior MIT administrators, the MIT Intellectual Property Office, and MIT stakeholders in the management of copyright here at MIT - faculty, librarians, staff, students.
- Incentives for change. How can the Libraries, IS, and the MIT administration work with faculty to encourage them to participate in this new approach to distribution of their scholarly output?
- Measurement. We must develop both quantitative and qualitative measures for the MIT publications environment; measurement of storage requirements and renewal, cost analysis, staffing issues, etc. Qualitative measures must include the benefits of MIT-based collection, storage, and distribution, the positive effect this has on making research more efficient and effective, and the satisfaction of the audience that relies upon MIT's academic products.
- Storage. We will develop models for the long term storage of electronic information; it's renewal and transition to new platforms and continued assurances of interoperability. We will develop preservation methods to insure the long term availability of these records to meet the future scholarly, administrative, and legal requirements.

DLI Conclusions and the Future

When the MIT campus was designed and constructed in the early decades of this century, a conscious decision was made to build the campus along interconnected corridors that would link academic departments. This axis has become known as the "infinite corridor," and its purpose is to promote conversation and interchange among students, faculty, and staff. This was viewed especially important for the cross-fertilization of interdisciplinary studies. What does this have to do with the DLI? It is an early analog of the DLI purpose to nourish and encourage the quality of education and research for the entire MIT community. Within the Athena computing environment students, faculty, researchers, librarians, and information technology specialists often learn and share information cooperatively. The DLI provides the information layer of this learning environment and helps to build the electronic infinite corridor.

As we begin to enter a new century, we are building what Professor Joel Moses, Dean of the School of Engineering, has described as "virtual centers", collaborative endeavors which are enabled electronically and which permit participants to remain in their home location. In these virtual centers, faculty and researchers conduct their work electronically, both the information gathering and the modeling of experiments. The key advantage for administrators is that virtual centers require no real estate and faculty are able to remain active in their home departments more easily. As an enabling information environment which permits researchers to validate existing knowledge while they simultaneously create new knowledge, the DLI increases the quality and productivity of the MIT community.

The adventures in the Distributed Library Initiative at MIT should not be construed as a "how we've done it good" report. Clearly, we have not accomplished the DLI; it is an ongoing, changeable realm which changes as the information needs of the MIT community change. Rather, the DLI, is our collaborative effort to provide quality services and to learn about ourselves, about the nature of information and its uses, and to excite the community about the potential of networked information. It is part of the MIT character to share what we've learned in hopes that our experience will benefit other institutions.

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The ELISE Project : Visual Information Retrieval and Delivery

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John Eyre started his career as an electronics engineer, completing an apprenticeship with GEC and spending 6 years in the Royal Air Force as a flight simulator engineer. After obtaining a 1st class honours degree in computing and cartography from Oxford Polytechnic he worked as a CAD systems sales support engineer. He has now been with De Montfort University for almost 4 years where he currently manages a courseware development group, creating computer based training products for the education and commercial sectors. He is also technical manager on a European project concerned with providing image access to users connected to the Internet.

Abstract

The aim of the ELISE project (Electronic Library Image Service for Europe) is to investigate the feasibility of providing an electronic image delivery service to European member states via international networks, by developing a prototype system.

The prototype will provide access to images via a detailed textual record incorporating fully indexed and searchable fields. Images are identified by fields in the database which contain pointers to locate the files. The database and imagebank can therefore be stored in different locations.

Image quality provided by the system is established as a compromise between storage requirements, network speed, image decompression speed and what the copyright owner will be happy to provide. Small 'thumb-nail' images are used to provide a visual browsing facility.

User interfaces have been developed for both MS Windows and X-Windows. Although they are different environments, both systems provide a similar look and feel with the same functions.

Access to databases and imagebanks can be provided on a stand-alone PC or Unix workstation, over a Novell network or by using a TCP/IP network. This extends potential access to all who have the facility to connect to the Internet.

The project has supported both established and developing standards and uses public-domain software wherever possible.

This paper looks at some of the main issues involved in undertaking such a project, particularly user requirements, database selection, image handling, network support and user interface design.

Background to ELISE

The ELISE project (Electronic Library Image Service for Europe) was established under the Commission of the European Communities DG XIII Libraries Programme. It was part funded for two years and is due to be completed by February 1995. It is co-ordinated by De Montfort University and the other partners involved are IBM UK Scientific Centre, The Victoria and Albert Museum and Tilburg University (Katholieke Universiteit Brabant) in the Netherlands.

There is a vast wealth of historically interesting and unique objects, manuscripts, paintings and photographs stored in museums and collections all across the world. These items are often closed to public viewing and access for the specialist researcher is, at best, restricted and typically impossible. The aim of ELISE is to *model* a European community facility offering access to full colour images and supporting text over the Internet. Once established, this system will be able to provide fast retrieval of a limitless array of image data to anyone having access to the Internet.

Using standards in network and database protocols, image compression formats and user interfaces, the system will be usable by the majority of the education and research establishment with a minimum of technical knowledge. An infinite amount of material is waiting to be brought to light through projects like this one. Some other projects that are actively investigating issues relating to digitising material for future network access include Mercury, VASARI, Van Eyck, RAMA, ELINOR and STILE.

There are many issues which have held back the development of digital image archival and its use in education and library automation, including:

- former unavailability, inadequacy and expense of relevant technology
- highly complex copyright and supply situations
- slow progress in the image information market
- lack of cooperation between subject specialists and technical organisations
- under-development of educational methods relating to images and their use.

All these areas have received great attention over the past few years and the technical requirements for the commencement of such developments have now been met. Images can be captured, digitised, catalogued, stored, retrieved, presented and printed to a quality that is more than acceptable to the majority of potential users. This new user-base being much larger than that of the existing clientele of object and image collections.

Technology is now not the limiting factor. Copyright issues have been a very real barrier to moving forward in using digitised images. With big companies like Microsoft, Sony and Adobe buying up software companies and vast image, film and video collections, great quantities of material that is either entirely owned or out of copyright is becoming available, enabling media and technology companies to select prime material for CD-ROM and on-line access.

The image information market has centred around established methods for production of newspapers, magazines and journals. Even with the advent of electronic publishing the move toward electronic storage and transmission of digital images has been slow.

CD-ROM production is increasing at an impressive rate, even with such a relatively small user-base (approx. 250,000 CD-ROM drives sold in the UK and 6 million in the US) and the expense involved in producing quality CDs, it is unlikely to produce the kind of profits that companies need in order to make the required investment, for some time to come.

Closer links are being forged between business and education. The need for universities to become more *income* orientated and the large educational market available for exploitation in this new field means that partnerships are being formed at all levels. Limited research and development money has meant that business and education have had to team-up in order to identify needs in both areas and fulfil those needs at the minimum cost to both parties. In many cases, economic rewards will not come until the technology is established in the home providing widespread general access.

This raises the question as to how should images be used. Who is the user and how should data be presented to the best effect? As images in digital format have not typically been available to the majority of academic staff members, the incorporation of this type of media into existing and new course material will be slow and will obviously depend on what material is made available and under what conditions.

Although the technology has been in use for nearly ten years, applying to office document management, computer aided design in engineering, and desktop publishing, the move towards general access to a broad cross-section of subject matter is new. It requires large amounts of resource and many technical and subject specialists. At a time when money is difficult to find, both in education and industry, it will pay groups to work together, co-operate and plan their projects as carefully as possible.

Project Considerations

Many of these new media projects are based on some type of government or European funding. Examples of these sources and the best way to approach each particular body are not addressed here. This paper will concentrate on the issues relating to specifying and planning the technical side of such a project, at least as it applied to ELISE.

If you have ever written a computer program, you will be aware that they almost always follow the same general structure:

- Input data
- Process data
- Output results

Well, there appears to be a similarly common structure in establishing an *electronic image service* type of project:

- Purchase equipment
- Select a database
- Capture thousands of images
- Design a feature-rich user interface

- Add some network support
- Obtain user feedback

Just as the program structure implies an order in the procedures, so there appears to be an order in the processes defined in our project.

The first problem is that designing a system is not a sequential process. Of course, some tasks need to be completed before others can begin, while others can be done in parallel, but they all depend on each other.

The hardware to be purchased relates to the database selected and network requirements. The image capture process relates to copyright and delivery platform. The database needs to offer the correct storage and retrieval methods. The user interface design is platform dependant. And everything begins with user requirements.

The Main Issues

The first and most important issue is

- User Requirements.

The other areas of concern include

- The Database
- Equipment
- User Interface Design
- Image Handling
- Network Support.

These need to be considered and updated as a whole and taken in context of how they apply to the identified user group and to each other.

User Requirements

Every project will have a user or a group of users. The first task is to identify the target audience. The easiest end-user to please is probably oneself. Even if you are a very self-critical person, to produce a product for ones own needs, in isolation from any other interference, is likely to produce something that comes close to fulfilling the objectives in a relatively short time.

The Internet is overflowing with such products. It is standard practice for 'C' programmers to develop general purpose tools (program libraries) which can be used over again in subsequent programs. Not wanting to re-invent the wheel, many programmers ask the world for help and thousands respond, or simply offer their newly developed code for others to use.

As soon as another person becomes a prospective user of your product you open the gates to criticism as well as productive comment. Whatever the feedback is it is more than likely to involve changes. The wider the user-base, the more useful feedback you receive, but the less likely you are to be able to please all the users of your product or system.

For ELISE, the user-base could have extended far and wide and included almost everyone. In the long term, users of electronic image collections will come from all walks of life and will use the images in many different ways. As this project was about establishing the feasibility of such systems it was appropriate to limit the user-base.

The partners came together due to their existing interests and expertise. The Victoria and Albert Museum is an obvious candidate to become a user of such a system. With such a wide range of subjects represented at the museum, the user group will be partly determined by the choice of images and their availability.

With two universities and a museum involved, three separate user groups were identified:

- Students and the General Public
- Librarians and Curators
- Specialist Researchers

Each group has its own specific requirements which overlap in some areas but definitely conflict in others. Also, each group can be split into two more groups:

- Computer literate
- Non-computer literate

To add further complexity, computer literate can be split into several further groups, the most pertinent being:

- Windows-aware
- Non-Windows-aware

There are hundreds of different computer systems in use in colleges, museums and libraries around the world. There is a tendency to group them together under headings like mainframe, mini and micro, but this does not tell us enough. What is important is what the user interacts with, not what goes on behind the scenes.

Is someone who spends eight hours a day using WordPerfect 5.1 for DOS really computer literate? They will certainly be confident using a keyboard and have an understanding of file handling but nothing further can be assumed. Someone accustomed to searching book titles using an OPAC terminal might appear very competent and at ease using the equipment, but are they database experts? PC-hacking students might be in their element customising MS-Windows but would they be able to compose a useful search string to an un-familiar database?

The obvious answer is to assume that the user will come to the system with no previous knowledge or related experience. The danger is that the system designer will either make the user interface so simple that it provides no useful purpose, or so full of options that it becomes over-complex allowing no-one to get the best from it.

Generally speaking most of the requirements of the user will be accessed through the user interface though this is not the only area that is affected by the target audience. User requirements are considered in each of the following sections but listed here are some questions that should be considered at an early stage in the project.

1. What is the primary user group?
2. Are there likely to be any other significant users?
3. How will users interact with the system - which computer platform?
4. Are there any secondary platforms that it may be essential to support?
5. Will the facility be provided in a specific location or via remote access?
6. Does the main user group have a common subject interest?
7. Can images and text be provided in this and related subject areas - copyright?
8. What type of textual support information will the user group expect?
9. Does this level of text exist or can it be generated?
10. Is the available text already in electronic form - can it be converted?
11. What kind of searching features are expected from the database?
12. Would potential users have access rights to the material selected?
13. Are charging and tracking mechanisms required?
14. Is printing and saving of text and images a priority?

The Database

For ELISE, the database's primary function is to translate the user's request and return appropriate images. The way that the database will be constructed depends on the type of query that the user is expected to perform. Therefore, the user requirements are considered before the database is chosen or built. The way to search the textual data is via access points, termed key fields, searchable fields or indexed fields, accessed by using a searching language. These searching (query) languages are typically proprietary to each manufacturer or database type, although some standards do exist.

There are two basic methods of identifying images. For humans it is relatively easy to recognise a picture by its content, without reference to a textual description. Objects such as chairs, tables, glass and people can be identified at a glance. However, for the computer this is extremely difficult, though there are projects achieving great success in this area, such as IBMs QUBIC (Query By Image Content), and in future developments it may be possible to include some of these features. For this pilot project the standard method of using textual key words and descriptions is being used.

Schemes need to be employed in order to be consistent when describing objects. There are some classification schemes (e.g. ICONCLASS) which use codes to identify subjects, themes and motifs. These can be highly complex and require knowledge of the coding scheme. An alternative is to use dictionaries and thesauri in order to control indexed words and phrases. An example of this type of control is the Art and Architecture Thesaurus (AAT) which is a hierarchically structured thesaurus dedicated to these subject areas.

As these methods are not already in full use in the ELISE partner establishments and because of their relative size and complexity, the pilot project does not fully use them, though reference to the AAT is made. Control has been sought by having one person enter all the textual data into the database, and a second person checking through it for consistence and accuracy. The pilot project extends to approximately 3,000 V&A records and has access to approximately 11,000 Tilburg records.

Another term that is high profile at present, particularly relating to databases is 'client/server architecture'. It works by splitting an application into two parts and connects them together via a network layer. This means that the server part (the database management system) can be treated separately from the client (usually the user interface and search generator). It also makes it easier to port a system to another platform. Some kind of storage and retrieval mechanism is also required for the images. Several options are available and questions relating to scaling and speed of access have to be considered.

Requirements will change as the project develops. Initially it was thought that it would be beneficial to select a database system that was able to handle the storage of binary objects alongside the text. This would allow small images to be held inside the database record providing potentially faster access to a 'thumb-nail' or 'browsing' image. It was later decided that it would be more suitable to treat the image collection and textual data as separate entities, thus providing a much more flexible system. Access to the images could then be made from several different interfaces and 'thumb-nails' could be stored alongside their full-sized 'working' images.

The database selected by ELISE is called INDEX+ and is produced by a company called System Simulation Ltd, based in Covent Garden in London. The system provides a full developer API toolkit for the unix server as well as an MS Windows API for developing client interfaces. The database files can also be copied directly to the PC and run as a 'stand-alone' for development and demonstration purposes. The company have now made many innovations of their own relating to the area of image storage and retrieval.

Equipment

Having identified the main user group it should be possible to decide on the most appropriate computer platform for them to use to interact with the system. This may be different from the computer selected to provide the system services, e.g. the database and imagebank servers.

In order to reach the biggest market as quickly as possible it would be difficult to justify building an interface for anything other than MS-Windows. If other platforms are high on the requirement list, then cross-platform tools can be considered as a way of keeping development times to a minimum. This may be at the expense of capital outlay (toolkits are expensive and multiple test platforms will be essential) with compromise on platform-specific features and style (each platform has its own interface standards).

Many projects have begun by producing MS Windows systems, only to migrate to using Internet tools like the World Wide Web (WWW) and Mosaic or NetScape. WWW provides established public-domain hypertext browsing facilities with full Internet support. Many WWW user interfaces offer support for any object type (e.g. text, image, animation, video and sound) and provide programming tools to allow adding features such as searching and usage tracking.

In an ideal situation, the choice of software would come before the selection of appropriate hardware to run it. It is often the case that application software is not available, especially in this field, or there has already been a large investment in equipment which will need to be made use of. In these cases it is essential to choose software development tools carefully.

For the ELISE system we selected the following hardware platforms:

File Server
IBM RISC 6000 / 360, running AIX and X-Windows
32 Mb RAM
3.5" Floppy Disk Drive
2 Gb Hard Disk Space
5 Gb Tape Streamer
Ethernet Interface Card, TCP/IP
24 bit Graphics Card
19" IBM FST Display

Development PC
Intel 80486 based PC running at 50 Mhz
MS-DOS 5 and Windows 3.1
32 Mb RAM
3.5" Floppy Disk Drive
500 Mb Hard Disk
PhotoCD ROM
1024 x 768 resolution with 64,000 colours (S3)
20" svga multisync monitor
Ethernet Interface Card, TCP/IP

PC Client (minimum spec)
Intel 80386 based PC running at 16 Mhz
MS-DOS 3.1 and Windows 3.1
4 Mb RAM
3.5" Floppy Disk Drive
Hard Disk with 5 Mb free space for GUI and temp files
640 x 480 resolution with 256 colours (svga)
14" svga multisync monitor
Ethernet Interface Card, TCP/IP

User Interface Design

User friendly, intuitive, simple, comprehensive, feature rich, standard, are all terms that suppliers use to describe their various products, especially in the move to graphical user interfaces (GUI) provided for MS Windows, X-Windows and other systems.

What makes a good interface design? Is it possible that a text based or MS DOS based interface provide a user friendly environment or is the pressure to move to GUIs justified? The truth is that no environment is generically user friendly, especially to new users. Friendly systems have to be designed and a great deal of effort is required to provide features that are easy to use, offer all the help a novice requires while providing all the power that an experienced user expects.

Systems are generally either user friendly or programmer friendly, easy to use or easy to create. These problems are only compounded by moving to a GUI based environment. Some GUI features are a benefit to users, for example, once the general interface tools have been mastered (mouse, icons, windows, etc.) they then apply to all applications in that environment. Complex programming problems such as supporting a variety of printers and graphics systems are taken care of by the operating system.

One of the first decisions to be made relates to whether the interface should specifically support only one database or should it be a more general purpose tool. There are many advantages for the system designer in knowing exactly what the type and structure of the database is. Both the interface and the database can be developed together. All field names and their associated indexes are known and can therefore be fully supported within the search screens and record display screens. Text substitution can be used to present field names in a more natural format e.g. 'obj_desc' can be replaced with 'Object Description', and indexes can be selected by the user in a similar manor, e.g. 'Index of People' might refer to 'p_index' in the database.

An alternative is to make the interface a single entry point for all users searching requirements. A generic search tool that knows nothing of the database to which it will ultimately connect too. In this way the user has only one environment to learn and master. Simple for the user, means more complexity for the developer. At present it is not possible to support connection to all the various database types, though it is becoming easier to support a number of different types. Standards such as Open Database

Connectivity (ODBC) offer access to relational databases and protocols such as Z39.50 provide a standard interface to database servers ihat support it.

As a prototype, ELISE attempts to work toward the generic interface model. While supporting the functionality of the selected database type (INDEX+), ELISE assumes (almost) no knowledge of the content or structure of the database. All that is required is an INDEX+ database with two known fields that indicate where the images are stored. The next stage of development is to provide support for Z39.50 allowing access to other systems, particularly that of our partner site at Tilburg University in the Netherlands, where they will have a collection of over 11,000 images stored in a 'Trip' database. They already have other databases (Fulcrum and Topic) which they have developed Z39.50 servers for and a generic MS Windows Z39.50 client which can connect to any of these.

There are many areas of the GUI that require thought. Design decisions need to be taken in consultation with several expert groups. Representation from end-users, subject specialists, database experts, education technologists, graphic designers and programmers is essential if a quality, usable product is to emerge.

From the users perspective there are a number of system interaction points that are critical. First, selecting the database to search. It is not yet possible to issue a search query against all known databases, and as databases are often subject specific it would not be efficient to send a search for 19th century chairs to an architecture database.

A useful description should be presented in order that the user can make an informed choice:

'Architecture of the 13th and 14th century'
is better than
'arch_7.dbf'

The next, and most important interaction is the Search Query screen. The point at which the user defines their request. Again, there are two main approaches. One method is to provide a full screen of 'input boxes' either laid out following the possible fields that can be searched (looking like a typical record entry or edit screen), or presented as a repetition of single word entries that can be ANDed or ORed together, supplement by associated index selectors.

Another approach is to confine the focus to a single entry box where simple or complex commands can be entered. As most users are likely to be novices and typically search for a single word in the global index, this method was decided upon for ELISE. It produces a much cleaner and simpler looking screen and experienced users could still enter queries of the following kind:

'(with edate from 1900 to 1910) and (smith index person)'

In a relatively small database this type of query is not necessary. The number of hits will be very small and a search for 'smith' would probably be adequate.

The interface offers help to aid the novice in their progression towards mastering more complex queries. Field names, indexes and dictionary words are all provided on screen, without being dominant. Double-clicking the mouse on any dictionary word should always provide at least one hit.

Once a search has been successful the next stage is to present the results in a format that is likely to be useful for the searcher to determine which record holds the information that is of most interest.

Different systems provide various levels of detail ranging from the use of a single field to a formatted presentation of a subset of the complete record. As ELISE is concerned with providing access to images, it would be appropriate to see an array of image icons, in enough detail to be able to recognise them but small enough to allow a useful number to be displayed on a single screen.

The X-Windows version of the interface provides this type of 'hit-list' by default, as the images can be generated and presented without too much delay. In the MS Windows interface this 'Lightbox' view has been relegated to be a selectable option, due to the time it takes to generate the display (15-20 seconds on a standard 486 PC). The default textual hit-list is provided by the use of a single field which can be user selected. Initially the 'object_description' field is used.

Once a record has been identified as being of interest, a full-size 'working' image can be accessed by 'clicking' on the 'thumb-nail' image. The size and quality of the images that the system provides is a trade-off between three main components: Image Quality, Access Time and Copyright.

Image Handling

Interesting objects and artifacts come in all shapes and sizes. Capturing these as images on computer is not a straight-forward process, although it is becoming easier. Some collections only exist as three dimensional objects, while others are held as photographic prints or slides.

Most universities have relatively large slide collections which are used to support their courses. As these are difficult to manage and exploit, they are prime candidates for digitising.

The digitised system would then support fast access to any subject covered, easy production of computer based presentations and simple distribution to students. Apart from the technical difficulties and cost, there is another major problem, copyright. This paper will not go into this issue in detail but it is an important factor to consider very early in a project. If a CD is produced with 2,000 images on it and one is later disputed under copyright law, the cost of production, distribution and recall of all CDs could be at stake. Many images in university collections are not copyright owned by the institution or their employees.

The V&A provide newly produced images of their current exhibits. This covers several subject areas and provides up to date textual data.

There are two basic methods of converting physical objects into electronic images (computer files), by the use of video and digital cameras or various types of scanner. Film free cameras either use video technology to capture an image to tape or video disc which is later converted through a computer interface card, or they use CCD arrays which generate digital images directly at the resolution of the array size. Scanners come in various forms, coping with capturing paper, film and slide based materials.

These methods produce extremely large computer files. As any time and resource allocated to capturing images would not want to be repeated as soon as a more advanced form of technology came along, the images have to be created at the best quality that can reasonably be afforded. This leads us to the KODAK PhotoCD system which uses film based technology to capture and store the image at very high quality and very low cost.

Using standard proven photographic techniques to capture images of flat paper and 3D objects, the developed film rolls are then processed by the PhotoCD workstation. The digital scanner can process a complete roll of film automatically, compensating for film type and exposure differences.

Five resolutions of each image are stored to PhotoCD, each disc holding up to 660Mb of image data. All images are stored as 'true colour' or 24bit images and photographic techniques are used to compress the images from 25Mb to just 4Mb without any noticeable loss in quality.

The two highest resolutions are too large for most PCs to handle. However, the 'standard' size of 768 x 512 decompresses to 1.2Mb and will fill half of a high resolution PC screen. This size also provides a very acceptable quality for visual evaluation, while not being of a high enough standard to be used in magazine printing. This was a criteria that the V&A were happy with, at least for a pilot project.

The small 'thumb-nail' icons are derived at 96 x 64 pixels in true colour, providing a raw size of just 18.5Kb. Even with these relatively small file sizes they are still far too large both for storage and transmission over the network. Some type of file compression is required.

The most popular file compression formats today are:

TIFF	Tag Image File Format, version 6.0
JPEG/JFIF	Joint Photographic Experts Group (ISO DIS 10918-1)
BMP	MS Windows BitMaP
GIF	Graphic Interchange Format '87

ELISE uses a bureau service to produce PhotoCDs from film strips. Each CD will contain a batch of images, typically 50-100. These are then processed by using KODAK Access software to save all the images to hard disk in a single process. They are stored as 24bit TIFF images at 'standard' size (768 x 512), each file being 1.2Mb. These files are then renamed to reflect the PhotoCD reference name (e.g. 0234-001.tif).

The whole batch is then transferred to the IBM RISC machine where they are converted to JPEG format. This is done at about seven times the speed of converting on the PC and produces smaller files for the same quality settings.

At the same time as making the standard size JPEG files, the PC is used to reduce and convert the TIFF versions to thumb-nail sized JPEG files and given the file extension JIF, in order to differentiate them from the larger versions with JPG as their extension. The JIF files are then converted to Windows BMP format. These BMP files are used as the first choice for display on a 256 colour Windows PC, producing a faster display.

All three image formats are then stored in a directory named after the first part of the PhotoCD name (e.g. 23381032). The TIFF files are deleted.

Network Support

No network support is required in order to use this system, though all data and images would have to be stored on the local computer. A 300Mb hard disk is ample for storing 3,000 images.

If a Novell or NFS network is provided then any or all parts of the system can be stored remotely. The database, imagebank and Windows client can all be stored and accessed via any named disc drive.

In order to provide network support over the Internet a more complex set of tools and features need to be provided. The client/server database provides the basis for connecting the client interface to the server database over a TCP/IP protocol. Using the latest network interface cards and software drivers it is possible to configure a PC system to support both Novell and TCP/IP using WINSOCK layers.

There is no such thing as a public domain client/server image server (unless you know better). The general method of transferring images would be to use a version of FTP to down-load images as they are required. This was implemented but was not ideal. The exact location and name of each image has to be known and a valid user ID and password provided in order to gain access. The protocol is also not designed to be used in a 'background' mode, it expects a user to be interacting with it. A better solution is to create a specialised image server that is both simple and upgradeable for the future. This is the method that Tilburg has implemented and that is currently being developed at IBM and DMU.

Using the specialist image server, images will be accessed via a 'look-up' table which converts references in the database to actual locations on the Internet. In this way the images can be moved without having to change database references in various locations, only the look-up table would need changing. Also, small blocks of image data can be transferred and allowed to be interrupted, and file tracking can be more easily implemented, in order to produce statistical report on usage.

Current State

ELISE has a working prototype which can form the basis of a live service. The system takes 24bit TIFF images (other formats are also supported), converts them to JPEG compressed (working) images and generates a thumb-nail (browsing) image, also in 24bit JPEG and optionally a 256 colour Windows BMP for greater display speed.

A database can be generated with any structure, taking text either from existing databases or entered via a standard word-processor or text editor. The database can be located anywhere on the Internet and provides user access via standard client/server protocols. The imagebank can be stored either on the same server or anywhere else on the world network. In fact, a database can have records that refer to images held in several different locations.

There are user interfaces for PC Windows and IBM RISC AIX X-Windows. While these are totally different platforms both programs offer the same functionality and present options and data in a similar way. Both platforms offer a 'Lightbox' as a method of presenting search hits to the user.

Evaluation of the currently available public domain Z39.50 examples has shown that while it is possible to convert them to work with MS Windows in 'C', it does not appear to be possible to create a link to Visual Basic that is stable. Any VB Z39.50 code would have to be generated specifically for that environment. A task that would take many months of in depth programming. As it was always the intention to develop a 'C++' based Windows interface for any subsequent ELISE development, it was felt that further time spent on VB Z39.50 coding would not be appropriate.

In order to demonstrate retrieval of Tilburg images over the Internet, ELISE will take sample data from Tilburgs TRIP environment and create an INDEX+ version containing pointers to their image-server.

The Future

De Montfort University has several collaborative bids awaiting response from funding bodies. The intention is to take what has been learned from ELISE and other projects and apply it to a working, commercially viable, image service to the education and commercial markets. Integration of several Electronic Library projects into a coherent university service will be another aim.

The next stage will be to identify appropriate uses for the images and methods of presenting them in interesting and structured ways. Groups of people from many different disciplines will have to unite to add structure and context to the collections that become available. Otherwise these databases will simply remain just interesting image catalogues.

IMPEL : A Research Project into the Impact on People of Electronic Libraries - Stage one - Librarians

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After a career in academic libraries, she joined the Department to develop online information systems teaching. Her research interests link studies of academic library users with developments in information technology. She is an active member of UKOLUG, the national user group for online and CD-ROM users, regular lecturer and workshop presenter on end user training and a member of the UK Institute of Information Scientists and Library Association.

Abstract

The IMPEL project is investigating the impact which the convergence of computing and communications technology is having on academic libraries, as the traditional archival role moves towards one of giving access to information, increasingly in electronic form. It aims to complement the discussion of technological developments by looking at the social implications of the move towards the "electronic" library, and a further shift in the balance of teaching and learning. The first stage is concentrating on the implications for library staff, highlighted by the recent publication of the Joint Funding Councils' Libraries Review Group - the Follett Report - and its emphasis on the need for

* The paper was presented by Joan M. Day.

adequate staff training and effective deployment if the benefits of convergence are to be realised. The paper will discuss the context of the research and report on a brief survey of 98 higher education libraries to identify the stage of development towards an electronically based service, from which six have been identified for in depth investigation. The emphasis on library staff reflects the interests of the joint partners in the research - an academic department involved in the education of library and information professionals, and a large, recently converged Information Services Department.

Introduction

This paper will introduce a current research project in academic libraries which is investigating the IMpact on People of Electronic Libraries - hence the title "IMPEL". The first stage is concentrating on qualified librarians, particularly those in the frontline information services role, and how their role is being affected by the move towards more electronically delivered information services. The project is a joint venture between the Department of Information and Library Management and the Information Services Department at the University of Northumbria at Newcastle. The context of educational change will be outlined and the aims and methodology of the project described. The results of an initial national survey and pilot case study are discussed.

Background

Universities in the UK are undergoing a period of intense change. On the one hand, student numbers have increased rapidly with a high proportion of mature students with non traditional entry qualifications forming the increased market. On the other, the unit of resource has diminished, with stronger government control placing financial constraints through a more centralised system of funding. The academic response is to change the methodology of teaching and learning, with the more traditional didactic teaching approaches giving way to more independent student learning. This requires provision of a wider range of learning resources rather than increases in teaching staff. Libraries have never had a more central role to play in the educational process, yet the need for increased information provision has coincided with escalating costs of materials, especially journal titles, and falling per capita budgets[1]. Added pressure is being placed on libraries in "new" Universities - the former Polytechnics - whose staff are now involved in research alongside teaching and require access to a wider range of material.

Information technology (IT) can be seen to offer a life-line. The convergence of computing and communication technologies provides potential access to more information than ever before. University campuses are increasingly wired up to offer distributed access to computing facilities, including the library catalogue. Whereas *traditional* online searching of commercial, often bibliographic, databases was the province of the academic librarian acting as an intermediary, new services are aimed at end users. CD-ROM databases and now networked services over JANET, the UK Joint Academic computer NETwork and the Internet give users easy access to an almost overwhelming amount of information through user friendly interfaces. The challenges to the academic librarian's role are exciting, but daunting for many who see the move towards the electronic library as a means of potentially by-passing them and their expertise.

The Electronic Library

Zhao defines the electronic library as "... an interdisciplinary computer application in which books and journals are stored in electronic form ... managed by complicated software, delivered through computer networks and viewed on personal interfaces"[2]. The electronic library is all about sharing information, changing the traditional archival role of academic libraries to one of a gateway to information held elsewhere - a policy of *just in time* rather than *just in case*. End user access to bibliographic services can lead to budget shifts from providing a broad based collection on site to one of concentrating on purchasing fewer heavily used titles and providing more electronic access to full text, including CD-ROM and greater use of interlibrary loan. Whereas *access* has been the educational theme, *access to information* is now the theme for libraries. We can see a continuum from the traditional *storehouse of knowledge* at one end to the *virtual library* or *library without walls* at the other, as new information is created as electronic books and journals.[3]

The virtual library appears to be a long way off in the UK. Access is still severely limited by number of terminals and speed of the networks, although a wider band-width SuperJANET system will soon be available. Compatibility, data security, copyright, licensing, funding and general etiquette of network use (or *netiquette*) threaten the vision of a seamless web of information. Document supply is the major stumbling block, and a recent overview by Tuck concluded that "the real problem is less to do with technology than with the warring relationships that exist between competing interests: protocol wars, sector wars, access wars, intellectual property rights and copyright wars".[4] Nor do those users who have access to electronic information systems always find them as easy to use effectively as might be expected from the marketing hype. CD-ROM interfaces are improving, and navigational tools are being developed like World Wide Web for the Internet, but finding the right information quickly is not easy, even for a trained information professional. Technology can be viewed as "both the root of our troubles and the font of our opportunities".[5] It is not a quick fix solution, and may well create more problems than it solves for academic libraries in the short term, not least the library staff.

The Follett Report

The rate of development towards electronically based library services in Britain has undoubtedly been hastened by the recommendations of the Joint Funding Councils' Libraries Review Group under the Chairmanship of Sir Brian Follett. The recent report, published in December 1993, recognises the potential impact of the shift towards information technology and information access, and sees the full exploitation of IT as "essential to create the effective library service of the future".[6] It addresses particularly the impact on library staff of its recommendations, and commissioned a consultant's report, the Fielden Report, on human resource management.[7] Fielden found varying degrees of convergence of services as institutions begin to develop an information strategy based on extensive IT networks. Libraries and computing services commonly work more closely together; educational development services and media production units may also develop close links information services. The degree of convergence may differ, but the need for library staff to operate in a much wider role is recognised.

The IMPEL Project

The impetus for the project came from the researchers' own experience of the impact of electronic information services on the work of subject librarians/information specialists in academic libraries. Rather than freeing staff time, end user systems like CD-ROM were found to place much higher demands on enquiry teams for point-of-need help, not only with use of the technology itself, but also for more user instruction into choosing appropriate databases and understanding the complexities of the information systems to which they were increasingly exposed. Where networking gives access from outside the library, user instruction offers an even greater challenge. A greater number of library staff need higher levels of knowledge and skill in both the use of technology and the wider range of services available. The impending convergence of the University of Northumbria's library and computer services as an Information Services Department made a study of developments elsewhere even more timely. An initial review of the literature showed little attention to the human factors in the change process that academic libraries were undergoing. Geleijnse, whose library at the University of Tilburg in the Netherlands is at the forefront of electronic applications, quotes the surprising statistic that in the literature of library automation, only 10% involves human aspects, whilst around 80% of the problems arising out of a typical automation project are human and organisational problems.[8] Much of this literature comes to conflicting conclusions, and may not anticipate the impact of networking developments which enable new functions to be performed, not as with automation, more efficient performance of existing functions.

The IMPEL project, therefore, is looking at the IMpact on People of Electronic Libraries, starting with qualified library staff. It is itself a collaborative project with its Project Co-directors coming from the academic Department of Information and Library Management and converged Information Services Department. The study is focussing upon:

- changes in the nature, structure and boundaries of the academic librarian's work, particularly in relation to learner support
- relationships with colleagues in other departments of the institution
- the impact of working in a converged service
- involvement in decision making for networked developments
- problems encountered and anticipated

- the skills, attributes and training needed to work in an electronic environment
- the effects of associated changes in management structure.

Rather than carry out random case studies across the continuum of development, it was decided to identify six at the more innovative end of the electronic library development spectrum. This was done using a simple methodology devised by Dr Susan Proctor of the Institute of Health Sciences at the University of Northumbria at Newcastle. Key factors in the development of an electronically based information service were identified in the literature:

- a written IT strategy
- the extent of convergence with computing services
- training for library/information staff (LIS) to operate in an electronic environment
- innovative use of electronic networks for delivering information
- student access to the JANET network.

Respondents were also given space for any comments on the impact of electronic networks on LIS staff and also if they would be willing to take further part in the study.

A single sided A4 questionnaire was mailed to the chief librarian or equivalent at 98 UK higher education institutions. 82 were returned - a very high response rate of 83%. The answers were allotted a score depending on whether they fully, partly or did not fulfil the criteria. 11 sites achieved the maximum score. Other criteria on size and type of institution were considered to reduce the field to six. The values used are not absolute; for instance, whether use of electronic networks is "innovative" is relative and subjective. However, initial visits by the researcher to the six sites shows all to be well advanced towards an electronically based LIS.

Initial Findings

The comments on returned questionnaires referred constantly to the increasing demands being made on staff as a result of networking, and "the impact is nothing to what it will be in a few years' time!" The need for *ongoing* staff training was stressed: "fortnightly training sessions for all professionally qualified staff"; "new training programmes in place to support staff multi-skilling", as was the special needs of older, long established members: "committed to study leave to long-serving professionals to update their skills" . New skills needed relate not only to IT and knowledge of electronic sources, but teaching, training and marketing of LIS services. Many complained of poor resourcing for networking but most are now making rapid progress, which will be fuelled further by the Follett Report. Library staff attitudes were reported as generally positive: "enthusiasm and initiative", "excitement", "ambition" but also "apprehension" and "pressure on time", and "no less demand for traditional services". Problems of "professional culture and identity" and "altering the professional/clerical divide" also emerged. Changing relationships with users, from "academics generally familiar with and enthusiastic for information sources accessible over the networks" to "considerable hostility" occurred. No-one implied that they were unaffected; rapid change was anticipated, even when little progress had yet been made.

Data Collection

A pilot study is in progress at the home institution. Semi-structured interviews are being carried out with a range of qualified staff, particularly in the subject teams, together with the Director of Information Services, members of the former computing service, library assistants and the Pro-vice Chancellor responsible for resources and author of the institutional IT strategy. Visits to the six chosen institutions have been made to collect background material such as institutional plans, IT plans and training programmes, and to identify interviewees. The researcher will spend up to a week in each institution over the next six months.

Outcomes

The case studies will be exploratory rather than descriptive, since an historical snap-shot would be of little value given the pace of change. Rather it is hoped to report positive outcomes in the following areas:

- organisational impact of educational and technological change on library management and personnel
- social impact of educational and technological change and the cultural implications for library management and personnel
- the knowledge, skills and training required of academic librarians and implications for initial and continuing education and training

- factors which influence strategy in implementing electronic networks
- key factors contributing to effective management of information provision on a networked campus environment.

Follett concluded that,

> "failure to provide staff with adequate training and deploy them effectively represents one of the single most important constraints on change and development in library and information provision, and can seriously undermine its effectiveness, especially when this depends on the implementation of new practices, or on information technology." [9]

IMPEL intends to show the way ahead.

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The MECANO System : A Mechanism of Automatic Comparison of CD-ROM Answers with OPACs

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Abstract

MECANO is a system that tries to bridge the gap between searching for articles on CD-ROM and finding the actual journals in an OPAC. It's aim is to improve the quality of service offered by libraries. End-users use databases supplied on CD-ROM because OPACs do not store information about the content of an article/book. The databases on CD-ROM, however, cannot contain information about the availability of the journals. After searching the databases on CD-ROM a user manually has to look them up in the OPAC. This can be a time-consuming and confusing process for an unskilled end-user. MECANO tries to automate

Publications of Essen University Library, Vol. 18, pp. 117 - 123, 1995

this process as much as possible by using the results of the CD-ROM search to find the holdings of the journal(s) in an OPAC. Unlike other systems MECANO is independent of the CD-ROM and the OPAC used. To achieve this kind of flexibility MECANO is built as an open system and relies on well-known standards, such as Z39.50 and USMARC. This paper describes the architecture of MECANO.

Introduction

MECANO, an acronym for Mechanism of Automatic Comparison of CD-ROM Answers with OPACs, is a project in the libraries program of the European Commission's DG XIII. It has seven partners from 5 countries. The partners are, in random order,:

• University of Amsterdam	The Netherlands
• Koninklijke Bibliotheek	The Netherlands
• Cap Gemini Innovation	The Netherlands
• Universitat Autònoma de Barcelona	Spain
• Bergen University Library	Norway
• Biblioteca Nazionale Universitaria, Turin	Italy
• Patras University	Greece

The project started in January 1994 and will run for two years.

The main result will be a prototype of a general system for combining the results of CD-ROM search actions with availability information from OPACs. The prototype will be a working system that can be used in the libraries of the partners which all have different OPACs and CD-ROM services. The prototype will be a Windows application running on a PC.

There have been earlier attempts at the building of systems with a similar scope. However, these systems almost always depend on the presence of a specific key, e.g. ISSN, or another attribute. This makes them less usable in the general case. In the design of MECANO this is not done. MECANO will be able to handle ISSN but can also handle titles that have no key at all.

Figure 1 gives a simplified picture of MECANO. Both the CD-ROM and the OPAC are considered external systems where MECANO is concerned. Wherever possible communication with external systems is done via well known and well-used internationally accepted standards such as Z39.50 and USMARC.

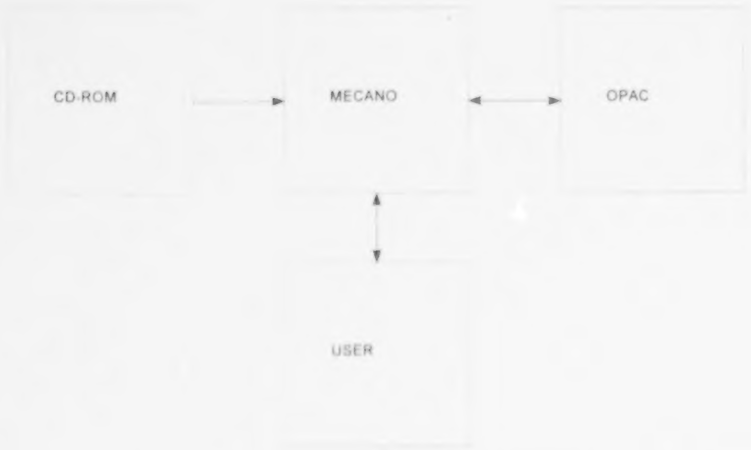

Figure 1: MECANO and enviroment

Figure 2 gives an overview of the basic architecture of MECANO. The left column shows the consultation of CD-ROMs, the right one demonstrates the process of extracting holding information from the OPAC and the one in the middle is the core of MECANO. This is were the information of both is matched and were the results are presented to the user.

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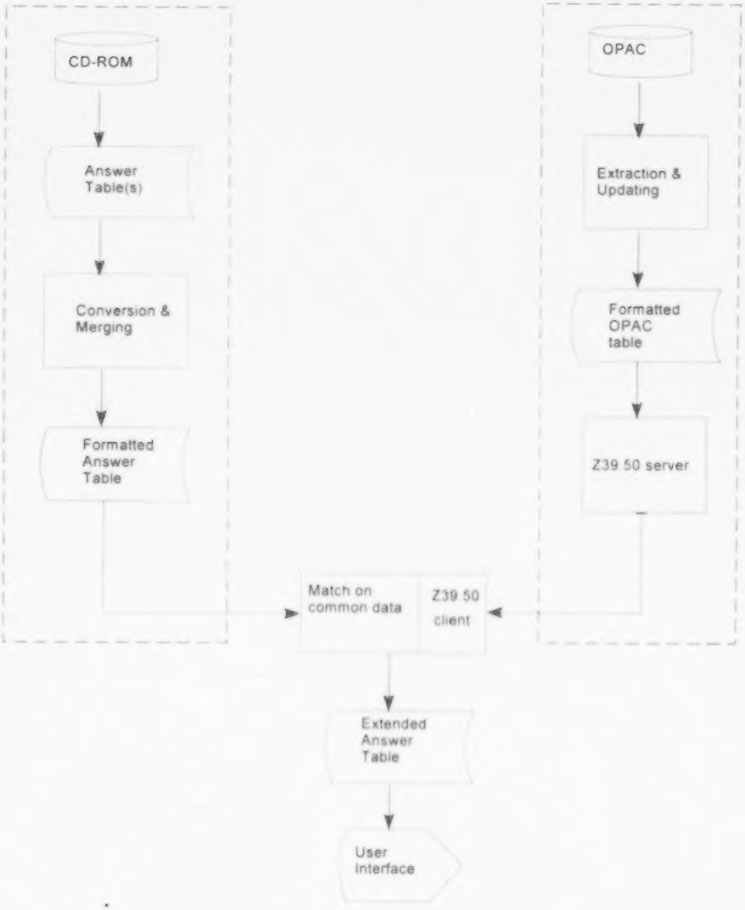
CD-ROM
Answer Table(s)
Conversion & Merging
Formatted Answer Table
OPAC
Extraction & Updating
Formatted OPAC table
Z39.50 server
Match on common data
Z39.50 client
Extended Answer Table
User interface

Figure 2: MECANO architecture

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Accessing CD-ROMs

In accessing databases on CD-ROMs we encounter the problem that there is no generally accepted method of access. Each database comes with it's own search-program. SilverPlatter is promoting a standard way of accessing databases on CD-ROM but at the moment this only works for CD-ROMs published by SilverPlatter.

Apart from this there also seems to be no standard format for storing article information. Not every database offers the same attributes and if they do they sometimes differ in the representation of the information. For instance, some databases store the complete title of the journal ("Journal of...") while other abbreviate ("J. of...").

Because of this problem MECANO works internally with an own format and representation. To achieve this we create a conversion routine for each CD-ROM that transforms the CD-ROM output into the MECANO standard format. This is a far from ideal method but at the moment the most pragmatic way of eliminating the differences between CD-ROMs. This is the "Conversion and Merging" part of **Figure 2**. After the output has been standardized we also eliminate doubles. The result is the "Formatted Answer Table". Information from the OPAC is added to this table later on. This way we leave the peculiarities of the CD-ROMs outside of MECANO.

From the results of the CD-ROM we only require that the article title and the journal title are present. This is a very minimal requirement that can be met by any CD-ROM. If more information is available, for instance year, volume, issue, author, ISSN, CODEN and USBC, this will be added to the standard format. If needed the information will be used. If, for example, we have an ISSN and the OPAC supports searching on ISSN, it will be used by MECANO.

We assume that the search-engine of the CD-ROM is able to store the search-results in a textfile. This file can be used as input for MECANO. There is no direct connection between MECANO and the CD-ROM. This has the advantage that MECANO is able to use the results of a search-action conducted elsewhere and use the results of several searches, even of different CD-ROMs, in one go.

Accessing the OPAC

From the OPAC we only need the availability information. There are many standards and local practices for storing this information. For MECANO we decided to use the USMARC format because that format is widely used and has a complete and well-structured set of holdings fields. Other formats do not have the richness of USMARC in this area.

There is no general used standard for storing holding information. This is very much a matter of local practice. For instance some sites do not store information about missing issues, here "1994" means: all the issues from 1994. Others do store all the missing issues. There are also variations in representation of information.

In MECANO we start with the very minimal assumption that the year must be present. We assume that if one issue is present, all the issues from that year are present.

This is a very pragmatic approach, but at the moment the best we can do. Perhaps as we go along we will use more refined methods of holdings matching. We offer the user always the possibility to look at the 'raw' data received from the OPAC.

We access the OPAC via the Z39.50 protocol. Z39.50 is an official American (ANSI/NISO) standard. It is a protocol that uses a client-server model that allows clients to search remote databases via a server. Using this protocol MECANO is able to search in OPACs without having to know the implementation details of the specific OPAC. Given the increasing popularity of the protocol we expect more and more OPAC suppliers to offer it.

The Two Versions of the Prototype

We have chosen to use the Z39.50 protocol because we think it will be widely used in the near future. At the moment, however, there seems to be a lack of actual implementations in software of the latest (1994) version of the protocol. We therefore decided to create two versions of the prototype: one that uses the actual Z39.50 protocol and one that uses stubs for the parts that deal with Z39.50 matter.

In the first version we will build the Z39.50 client (**Figure 2**) and the OPAC supplier takes care of the server side. The information coming from the OPAC will be gathered realtime. Because of this direct link to the OPAC we are also able to place a loan-request and other things. We see this as a possible extension of the MECANO system.

We ask the OPAC to support two things. First it should be possible to search giving a whole journal title. Secondly we want the returned holding information to be in the USMARC format.

The second version uses the same information but does not have a direct link to the OPAC. Instead the information is extracted periodically from the OPAC and stored in a special MECANO database. This database is managed by our own Z39.50 server-stub. Apart from problems maintaining and updating the database this also has the disadvantage that the data in the OPAC may have changed already. Resulting in an inconsistency between the database and the OPAC.

The great advantage of this solution with the Z39.50 server-stub is that when the OPAC supplier has his own Z39.50 server very little, perhaps even nothing, has to be done to adapt MECANO to the new situation.

The first version will be tested by the Koninklijke Bibliotheek. The OPAC-supplier of the Koninklijke Bibliotheek, PICA, has started development in building a Z39.50 server.

The second version will be tested by all other partners in the project.

Publications of Essen University Library, Vol. 18, pp. 117 - 123, 1995

Managing CD Changers of 6-777 CDs or a Multiple of that with PeriLIB Library Controller

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After solving his apprenticeship as RTV engineer in Germany. Reinhard Nedela worked in England and started his career 1970 at Honeywell in Germany and France for the international support of host systems.

He founded PeriTEC AG in 1985. His wide experience and understanding in the field of integration of systems allowed him to participate and lecture in international library congresses on the subject of CD-ROM integration in networks.

Abstract

The paper describes the integration of MS-DOS based applications for patent searches in very high quantity (3108 CD-ROMs) in the existing environment of a DIGITAL VAX installation at the National Swiss Patent Office (BAGE) in Bern. The author describes the use of four Swiss jukeboxes PeriLIB-777 to solve the quantity problem and the use of OmniWare PCs to solve the heterogeneous desktop problem (appropriate user interface) to use PATSOFT from Jouve for DOS and EPO Epoque for OS/2 to fully integrate up to 24 users in DEC workstations with OSF/Motif. The result of this integration is the reduction of time of availability of a document in the patent office for visitors and researchers from max. 20 minutes in paper form to 20 seconds online for approximately 300 million scanned pages of patent documents worldwide.

Patents are paper intensive documents. Worldwide about 37 million patents exist, which relate to about 12.5 million inventions. Every year approximately 1.2 million new patents are applied for, which means one publication of a patent document every 30 seconds! Today CD-ROM can stop that paper invasion. The Swiss Patent Office (BAGE) in Bern has acquired the necessary infrastructure in order to benefit from this advantage.

The office supervises several Swiss associations active in the area of copyright. It employs about 180 persons of which 35 are patent experts and another 12 are patent attorneys. The Swiss Patent Office is supervised by the Federal Department for Justice and Police. The Swiss Patent Office maintains a huge archive of patent documents from all over the world totalling in 27 million documents. The length of all paper shelfs in a single line would sum up to 12 kilometers.

Despite the fact that CD-ROM is a very compact storage medium the number of discs has already grown up to 2500 CD-ROMs by Summer '94 and continues to increase rapidly by approximately 40 CD-ROMs per week beginning in January '95. In the international intellectual property domain it is a known fact since '93 that all patent offices around the world will end issuing paper or microfiche documents by December '94. The only media to deliver patent information will be CD-ROM for the purpose of easy handling, easy transport and volume of data it can contain.

It is assumed that by the end of '96 about 4000 CDs will have accumulated. The new medium is certainly not introduced with the aim to replace the consultancy of the paper archive through the consultancy of the CD-ROM archive. Accordingly, it was mandatory to find an appropriate form of a new organization.

On the basis of VAX and DECnet we integrated PATSOFT and Pentium Library Controller

Since several years the BAGE is equiped with a data processing infrastructure based on DEC products. A DECnet with VAXs as server links about 100 X.11-terminals, 30 VAXstations 4000-VLC and a number of additional workstations. The VAX model 7620 supports the various desktop applications of the employees.

The task consisted of integrating the CD-ROM access into this existing environment. Essentially, answers to the following questions had to be found:

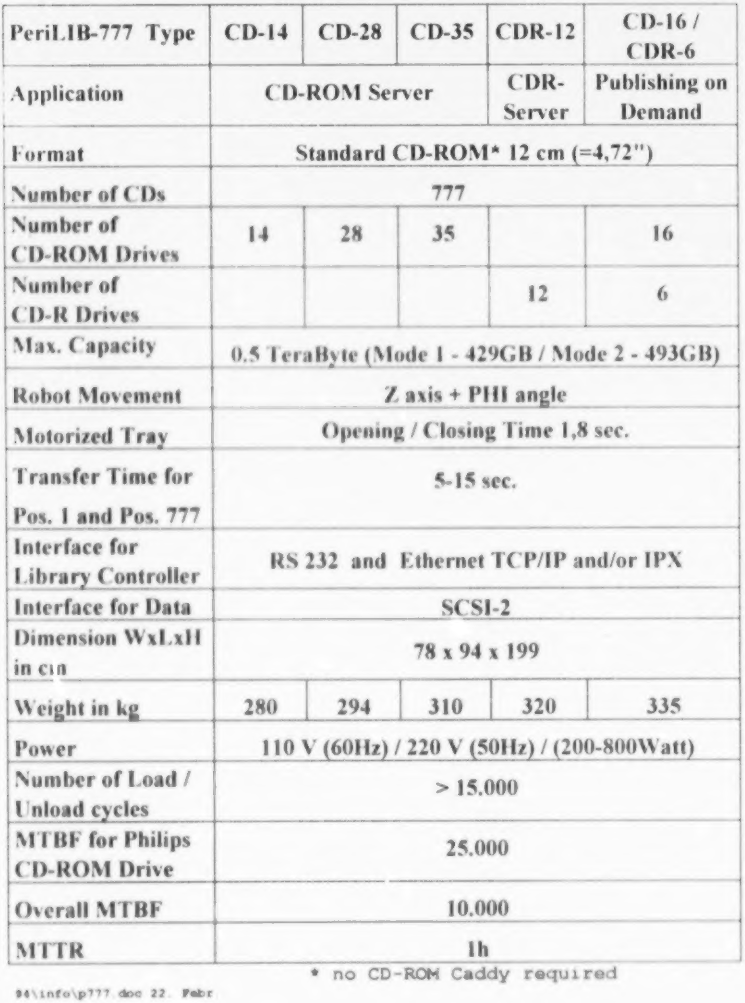
- How could the access to a large number of CD-ROM discs be automated?
- How could the retrieval software PATSOFT from Jouve, which is MS-DOS compatible only, be integrated into the DEC environment?

PeriTEC is specialized in CD-ROM concepts and systems solutions and has developed an automatic changer for 777 CDs (**Figure 1**). This jukebox is one of the biggest which exist so far.

In this device the discs are stored in a paternoster like circuit. There is space for 14 to 35 CD drives. A Pentium Library Controller manages and monitors the functioning of the jukebox and the CD server Ultra*Net provides access to the data on an MS-DOS with Windows for Workgroups network for up to 50 users simultaneously. The project started in January '94 with one PeriLIB-777 and has been expanded in November '94 to four PeriLIB units totalling 3108 CD-ROMs (**Figure 2**). Four PeriLIB-777 give access to 2.100 GigaBytes or more than 2 TeryBytes of information.

In order to remain compatible with the retrieval software PATSOFT from Jouve, Ultra*Net is exclusively Intel PC and DOS oriented. For the integration of the jukebox into the DECnet, PeriTEC used the OmniWare modules from Logicraft. OmniWare consists of hardware and software and uses the XNS protocol to get the screen output to the end user OSF/Motif workstation. The hardware is a board which is plugged into a PC processing unit (without screen and keyboard). The board functions as a bridge between the MS-DOS network to which the jukebox is connected, and the Ethernet users. OmniWare hardware and software together emulate the MS-DOS environment on an X-terminal or a workstation thus opening the access to the CD-ROMs. One OmniWare unit can only serve one X.11-terminal; therefore PeriTEC has installed twenty-four OmniWare PCs which have twenty-four 3COM cards to read the compressed GTI patent information database. Three DEC PCs in the reading room are connected directly to the NetBEUI network. For obvious reasons they do not need OmniWare. The PCs are equiped with 3COM network card and KOFAX interface for accelerated printout of retrieved documents. The printers are HP LaserJet IVsi for printing the required documents on demand with approximately 15 pages/minute double sided.

Several utility applications are also available from the PeriLIB-777 system and its Pentium Library Controller. One of them is the Swiss Phone Directory, several documentations published at regular intervals by the



PeriLIB-777 Type	CD-14	CD-28	CD-35	CDR-12	CD-16 / CDR-6
Application	CD-ROM Server			CDR-Server	Publishing on Demand
Format	Standard CD-ROM* 12 cm (=4,72")				
Number of CDs	777				
Number of CD-ROM Drives	14	28	35		16
Number of CD-R Drives				12	6
Max. Capacity	0.5 TeraByte (Mode 1 - 429GB / Mode 2 - 493GB)				
Robot Movement	Z axis + PHI angle				
Motorized Tray	Opening / Closing Time 1,8 sec.				
Transfer Time for Pos. 1 and Pos. 777	5-15 sec.				
Interface for Library Controller	RS 232 and Ethernet TCP/IP and/or IPX				
Interface for Data	SCSI-2				
Dimension WxLxH in cm	78 x 94 x 199				
Weight in kg	280	294	310	320	335
Power	110 V (60Hz) / 220 V (50Hz) / (200-800Watt)				
Number of Load / Unload cycles	> 15.000				
MTBF for Philips CD-ROM Drive	25.000				
Overall MTBF	10.000				
MTTR	1h				

* no CD-ROM Caddy required

94\info\p777.doc 22. Febr

Figure 1: PeriLIB-777 - Library System

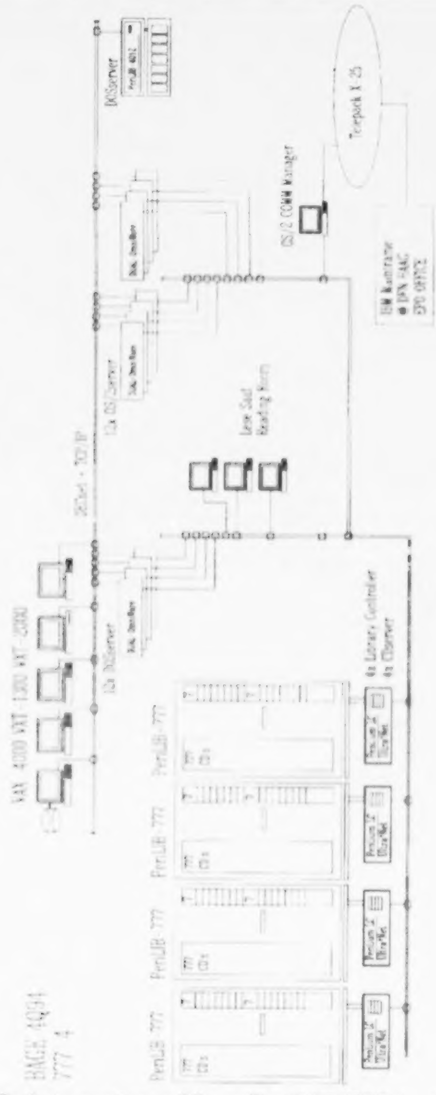

VAX 4000 VXT-1300 VXT-2000
DOServer
Telepack X.25
OS/2 COMM Manager
12x OS/2 Server
Low Cost Reading Room
EPO OFFICE
4x Library Controller
4x CDserver
PeriLIB-777
PeriLIB-777
PeriLIB-777
PeriLIB-777
777 CDs

Figure 2: Integration of four PeriLIB-777 in the net of the Swiss Patent Office

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European Patent Office like BULLETIN and ACCESS, as well as the bible of the patent officer, the International Patent Classification (IPC) which, in most cases, is the point of departure for a patent search. The often used ROMARIN brand name database from the World Patent Office in Geneva is also used in following manner: PeriLIB Ultra*Net uses the preCACHE function to get CD-ROM data much faster into the retrieval engine (client/server) by using CDdata in ISO9660 image format from hard-disc drives which are connected on the Ultra*Net CD server. This service is fully transparent and compatible with PATSOFT, DATAWARE and other DOS or MS Windows retrieval engines and provides very fast access to all INTEL PC or OmniWare PC users at the same time up to 40 simultaneous users per title because data comes from hard-disc instead of the slower CD. The speed gain in access time is between 5 and 15 times better than with the best CD-drives on the market today. This product is the only CD-ROM server solution from Europe (developed by R&R Messtechnik in Graz, Austria) and has a European success in the biggest university libraries for TCP/IP and Internet access (approximately 60 installations based on Windows NT). The typical CD servers built (for universities in smaller CD quantities) use only 7 CD drives and some 10-50 Gigabytes of hard-disc as space and can carry out up to 450 CD-databases in one Windows NT 3.5 CD server.

The DECinfo magazine in Switzerland stated:

> The CD-ROM solution realized at the BAGE is an excellent example of modern systems integration. It demonstrates, how systems solutions are worked out by cooperation between the customer who has the delicate task to elaborate the specifications, and an experienced supplier. The success of such projects not only depends on technical knowhow but also on the capacity of the participants to coordinate their efforts and to work as a team. The project also shows the inherent potential of a VAX or a DECnet to become extended and updated to an Open System in the modern sense and, thus, to maintain a high level of value and a stable working environment over a long period of time.

The long term planning of integration plans in Switzerland are discussed with BAGE and ETH Zurich to access the jukeboxes and all patent CDs from the distant Zurich library over public or scientific networks using TCP/IP and the Library Controller management from PeriTEC. Thus saving a second installation and purchase of duplicates of all patent CDs in Switzerland.

Assistance from the Netherlands

For more detailed searches in worldwide patent information which is not yet on CD-ROM another variety of search terms, eventually an abstract or an image of the main object of the invention are required. This kind of information is contained in "Epoque", a database of the European Patent Office in The Hague. In "Epoque" the first pages of all patents of the world are reproduced with features like the patent number, the date of application, the names of the inventors and the assignee, the patent classes to which the invention is attributed and the status of the patent. The BAGE has access to this database through an X.25 Telepac link. Since "Epoque" runs on an IBM mainframe in The Hague and necessitates an OS/2-client at the patents attorneys desk, the BAGE was confronted once again with the problem to find a convenient interface. Relying on the OmniWare-module, PeriTEC was able to provide the solution. A side arm with an OS/2-server was added to the Local Area Network of the BAGE. The server manages the link to Holland and provides simultaneous access to the "Epoque" database for up to ten users in Switzerland. The OS/2-branch is connected to the DECnet via the OmniWare module.

These 10 OmniWare PCs and the first 14 OmniWare PCs from the Ultra*Net PeriLIB-jukebox access can be used with load balance, this means if a small number of "Epoque" users is active, more users to the four PeriLIB-777 CD jukeboxes can happen and vice versa.

CD-ROM Server in the Internet

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Gerold Ritter studied technical physics at the Technical University of Graz. He founded R + R Messtechnik und Handel GmbH in 1984 and is involved in CD-ROM projects since 1990.

Today, Local Area Networks (LANs) are normally equipped with file servers and in use with CD-ROM servers. Because of new possibilities and technical evaluation, we also use Gopher, WWW server etc. in order to give access to other organizations.

Because of the capability of the Internet to provide also worldwide data transfer and communication, we added an Internet based CD-ROM server service to our existing CD-ROM server products. After an evaluation phase with different software platforms (Solaris, NextStep, OS/2 and Windows NT) we finally decided to release the product on Microsoft's NT platform. Reasons for that decision were:

- the possibility to use different hardware vendors (INTEL, DEC, MIPS) and announcements from Apple (POWER PC) as well as SUN to join that hardware platform later.

- the basic features of Windows NT (further called "NT"), like real multitasking, high protection level and the possibility of symmetric multiprocessing,
- the strength in supporting different networks (protocols) and complex programming features and
- the Microsoft Windows Graphical User Interface (GUI).

Mechanisms had to be found to implement a CD-ROM service in a new way besides existing GATEWAY solutions (Telnet like). Also the growing computing performance (from personal computers) helped us in going new ways. We defined a possibility which can be used in LANs and WANs in order to operate every CD-ROM database from a PC workstation. By using our software, the local PC is running in so called "local mode", just with some protocol stack loaded (it does not matter whether it is TCP/IP IPX/SPX or any variant of NETBIOS or NetBEUI).

With our software we set up a network connection that establishes a point to point connection from a local PC to our server. It does not matter where the server is located at and what type of communication will be established. From the moment of having this connection, the "remote CD" is mounted to the local PC and accessible exactly in the manner as if it would be in a local CD-ROM drive. It can of course also be a cached CD image (on a hard-disc) which gives much better multiuser performance.

So the CD or the related database station sees as if it is a local CD-ROM drive operating the specific CD or multiple CDs. If the server is far remote, via the Internet or just within the institution, there is no difference to the application. We even do not need to install any network retrieval engine because it appears as local application. Multiuser access as well as licensing is controlled by the NT server. Different levels of access rights can be granted, from the anonymous (guest account) to the group related accounts (these will be able to operate only with the group trusted databases) to the administrative level (with highest access rights).

In order to explain the basic behavior of the server some screen snapshots will be needed. The main server screen shows the started protocol stacks as an icon, and actually logged in users as mirror images also. The server system description with allocated accounts (users with granted access rights) can retrieve information (available databases with their granted access right to different groups or accounts).

Following is an outline of our installation experiences from different sites. At the very beginning we had to introduce Windows NT as a starting point because it was not in use in that time. We discovered that all participants, the people from the IT departments as well as librarians, came into positive touch very quickly. The big step was from the classical PC single user to a much more flexible and powerful multi user.

Also using many resources in the existing networks, like using Novell print queues, the simple possibilities to generate local or remote backup, user Novell or NFS file systems and server, implementing own FTP servers on the same machine etc., helped a lot.

The degree of security was very satisfactory and appreciated from the system administrators. The implementation of RAID Arrays, which is supported directly from NT, proofed to be successful. A new generation of powerful CD-ROM servers was born. There is no real limit today for the size of one installation. Using 10 GByte discs, you can operate 500 to 1000 titles from one server. There is no further need for multiple server cascading. The management is much more transparent on such systems. Having multiple CPUs in the system you can run hundreds of users simultaneously even on multiple network cards concurrently and overcome the limit of single network segment.

Technological Speedtraps on the Information Superhighway

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Abstract

The Information Superhighway has been referred to as the "Superhypeway" with good reason. Promises for a national information infrastructure (NII) are tempered by technological problems and social reality. In keeping with the highway analogy, several problems in implementing the NII agenda are seen as speedtraps on the highway. Speedtraps discussed in this paper include: Deregulation of the telecommunications industry, costs, the role of industry and libraries, censorship and privacy issues, public acceptance, and network culture. If libraries are to remain viable information intermediaries, they must become an integral component of the processes they serve.

Introduction

A recent count in selected U.S. newspapers showed that the information superhighway was referred to as much as 1,200 times a month. Unfortunately, perhaps more than any other technological development, much of the coverage is not flattering. Critics focus on the garbage littering the highway, road repairs, traffic accidents, speedbumps, toll booths, and hijackers. One critic goes so far to say "Warning: when you travel the information highway, don't stop; keep your windows rolled up and your hand on your wallet."

Two of the most striking references are to the "Internot" or the "Information Superhypeway". Authors are referring to the stark contrast of future visions versus current realities. Consider the technophoric rhetoric of Vice President Al Gore when he argued to secure funding for the National Research and Education Network (NREN). Vice President Gore is generally credited with coining the term "information superhighway". He stated "there is no longer any doubt that such machines will reshape human civilization even more quickly and more thoroughly than did the printing press. Gutenberg's invention ... seems to pale before the rise of electronic communications."[2] These words can certainly sound like hype to a person who cannot even program a VCR.

The inference of data transmission at giga bit speeds is also a lot of hype. It creates a feeling of freedom to fly, only to be arrested for the lack of a license, or to be stopped at a toll booth. Distances are reported as "the crow flies" but in asking for directions or using road maps, it becomes painfully obvious that "you can't quite get there from here." Despite the existence of a superhighway system designed to move people quickly between distant places, rules of the road appear to be based on principles of slowness rather than speed. You may be familiar with the trucker's jargon for the interstate highway. The term "double nickel" refers to the anachronistic 55 mph speed limit on most of America's highways (approximately 90 kmph). If one expects to go anywhere in a timely fashion, one must break the rules of the road. It is this paradox which results in speedtraps. For example, Linndale, Ohio, with a population of 200, is a 3-block long city that is situated on 440 yards of interstate 71. Even though there are no on or off ramps, the city drops the speed limit on the Interstate to 35 mph. Last year the city police issued 5,000 tickets totalling $400,000, or approximately 80% of the city budget. True to bureaucratic form, the State of Ohio did not outlaw the practice, but instead passed a law stating that a town must own at least 880 yards of highway before the speedtrap is legal. Future technological developments hold the potential for many speedtraps for libraries. The purpose of this presentation is to briefly review the dangers of the road, lest librarians experience that hopeless, sinking feeling associated with the blinking light in the rear view mirror. My comments will deal primarily with developments in the U.S.

The creation of an information superhighway is often compared to efforts of the Eisenhower administration's initiation of the national highway system in the 1950s. Construction of highways meant laying out routes and pouring concrete. Construction of the information superhighway is not as straight forward. It means that fiber optic networks or emerging technologies such as cableless cable and microwave telephone interfaces may dominate future telecommunications systems. "The technology for the information highway exists, but it will not be fully operational until an infrastructure is in place. It's like if you build the interstate highway system with no on-ramps, no hotels, no road signs or maps, no rest stops, and no gas stations."[2]

The embodiment of a national information superhighway is concurrently referred to as the National Information Infrastructure (NII). "The NII will be used for everything from serious scholarly discourse and cutting-edge research to every couch potato's dream of unlimited and instant access to thousands of TV programs, movies, and interactive games."[3] The Clinton administration summarized its vision of the NII as "a seamless web of communications networks, computers, databases, and consumer electronics that will put vast amounts of information at users' fingertips. Development of the NII can help unleash an information revolution that will change forever the way people live, work, and interact with each other." Larry Irving, Assistant Secretary for Communications and Information in the Commerce Department noted in testimony on January 27, 1994 "Indeed, the full potential of the NII will not be realized unless all Americans who desire it have easy, affordable access to advanced communications and information services, regardless of income, disability, or location."

The current technology for the information superhighway is the Internet. The Internet is a worldwide web of some 22,000 interconnecting networks in over 100 countries, 2 million computers, over 30 million users, and growing at over 8% per month. If the Internet were to have a physical center, it might well be in the Washington D. C. Much of the traffic finds its way through the Washington D. C. area because of the original links set up by the Pentagon's Advanced Research Projects Agency (ARPAnet) and the National Science Foundation. More than 1,200 information technology companies are located in this area, with over 50% of the worldwide Internet traffic channeled through the Washington-area routing system. No one company runs the Internet, but many network providers are connected to each other at a site in Macclean, Virginia called the Metropolitan Area Ethernet (MAE East). MAE East is also the main data link for Europe, and direct connections to networks in Thailand, India, and Russia. MAE East also links the NSF network, making it perhaps the most important link in the Internet.[4] The physical proximity of MAE East to the Library of Congress, the National Library of Medicine, and to Congress may prove to be critical in maintaining the Government's commitment to libraries in the NII agenda. The Government, at the moment, is trying to dissociate itself from technological developments in the Internet. It is exactly this effort which is causing concern.

Deregulation

One of the biggest speedtraps feared by telecommunications providers is the government's deregulation initiative. Essentially, the federal government's official position is that deregulation will increase competition, provide more services, and ultimately reduce costs. The hidden agenda is that the government wants to free itself of the expense of building and maintaining the highway. Reluctantly, the government recognizes that past regulation, such as anti-trust legislation and FCC regulations, have had questionable impact. Yet, as companies jockey for strategic positions within the NII, they cannot help but reflect on the basic principle which has governed government complicity in the past, namely "if it moves, regulate it." In fact, some see regulation as simply a hidden tax. In American history, never has government regulation been as onerous as it is today. The number of federal regulators hit an all-time high of 126,815 in 1993, the first year of the Clinton presidency, and that their ranks will swell by another 3,000 in 1994. The number of pages in the Federal Register, the volume in which all new regulations are published, rose to 69,688 last year. Government spending on regulation in 1993 was $11.8 billion dollars, and it has been estimated that the cost of regulation in the U.S. in 1993 was $581 billion, or roughly one-tenth of the gross domestic product. Furthermore, it has been estimated that by the year 2012, every cent that Uncle Sam collects under current law will either service the national debt or go to entitlement recipients.

The success of the deregulation strategy may also be tempered by the NII as being viewed a Clinton administration program. The Feds involvement in the NII may wane with changing administrations, as much as the Bush administration's super collider was canned in Texas. In any event, the NII agenda may be altered drastically. The U.S. Senate's decision to dump a sweeping telecommunications reform bill was partially due to partisan squabbling. This in turn led one writer to say that "the most lamentable cliche of the decade is the information superhighway."

Libraries are also wary of a regulation speedtrap. Because of the dominant role of the private sector in building the NII and the move toward deregulation, there is a concern that libraries may not be able to afford access fees charged by the private sector without some type of government assistance or development of preferential rate structures. Even if government regulation stipulates the existence of libraries, will it be a haven for the homeless, the unserved, the underserved, and the "don't wannabe" served? If the speed of technological development continues, government regulations that protect libraries may always be too slow in coming. The government's yugo will not be able to overtake the Mercedes speeding on the infobahn.[5] Unable to keep up with the speeders, institutions such as libraries, living on the good will of providers, may be relegated to the no-passing lane.

Role of the Providers

In addition to a host of consumer-related services, seven basic businesses are actively involved in some aspect of the NII. These include:

1. Computer software/hardware companies;
2. TV/movie studios;
3. CATV (cable TV);
4. telephone companies;
5. consumer electronic firms;
6. publishing companies; and
7. broadcasters.

"All of these sectors are competing with each other or actively 'carpooling' to develop infrastructures and the information components of the NII." There is a belief that those who own or control data will be the winners in the emerging marketplace.[6] That is why telephone companies want to get into cable, why newspapers are getting into television and online computer services, and so on. Reed Elsevier has recently purchased the Lexis/Nexis online information business for $1.5 billion dollars. AT&T is nurturing a project code-named "sage". Sage will link screen phones to banking, shopping, and other consumer services. IBM has suggested it is moving into content and telecommunications on the information superhighway.

MCI, currently a long-distance carrier, is hoping to have local switched telephone service up and running within six months, and is also testing telephony over cable. MCI has lured Vinton Cerf, one of the original developers of TCP/IP, to head its six-year, $20 billion dollar project called network MCI. The venture is designed to take MCI beyond long-distance service into multimedia software. MCI, Bell Atlantic, Ameritech, Pacific Telesis and Time-Warner say they plan to spend $100 billion over 15 years on building an advanced data network. MCI's service is being positioned as the backbone for the NREN, having been selected by NSF to link 5 of America's supercomputers. Another example is the National Information Infrastructure Testbed (NIIT). The NIIT is a coalition that includes AT&T, Sprint, Hewlett-Packard, Digital Equipment Corporation, Sandia National Labs, and Syn-Optics Communications. This coalition has been created to develop a nationwide trial highway, work out bugs, and see if there is a market.

Future regulatory and technological patterns make appropriate acquisitions in the telecommunications field difficult. What seemed so clear 12 months ago is now shrouded in regulatory, technological, corporate, and competitive uncertainty. International cooperation will also have a significant, but unpredictable impact. For example, the Department of Commerce is talking with Japan and other countries about making the NII a global entity. Other countries, including many that are commonly classified as "developing" are expending considerable resources to build their own information infrastructures.

Costs

While the government is planning to spend approximately $1.2 billion dollars on the National Information Infrastructure over the next four years, it is estimated that the private sector will spend about $80 billion. How do they expect to recover their investment and show a profit? No one is clear how costs will be determined, or who will be subsidize the disadvantaged. The price for information is less clear. It has been suggested that pricing will mimic pricing for licensing rights for software.[7] Online businesses, such as

Prodigy, and Dialog, have been experimenting, but past experience has shown that pricing has not been consistent within each industry.

Companies are worried that the initial investments will not be recovered before the next technology develops. Estimates to deliver fiber optic service to residences have been placed at $2000 per house. Broadband ISDN (Integrated Services Digital Network) using existing copper from telephone lines seems to be the intermediate strategy. One NII cost study determined it would cost $120 per household per month for equipment, software, and linkages to access the superhighway. Currently, affordable is considered to be at current rates of spending for CATV, in the neighborhood of $20 to $30. Another report indicated that slightly more than 50% of people who buy a computer with a modem eventually connect to one or more of electronic consumer services such as Prodigy. Two things that are not as frequently reported. One is that most of the use is for entertainment, not information delivery; the second reason is that a majority of them cancel their subscription when they receive their first bill.[8]

What is clear is that the public will not spend more than it currently does on media, and the majority spend more on entertainment than information. Of four new channel offerings by Warner Cable, the Cartoon channel was by far the most popular. Sega is now offering games on cable, and the popularity of Multi-user Dungeons and Dragons (MUDDS) on the Internet is infamous. If spending on entertainment increases, will that mean less money spent for information?

With convergence of media, ultimate access to "infotainment" will be through what has been termed the information appliance.[9] The appliance will be an intuitive, ergonomically-adaptable, plug compatible, sound-activated universal device, perhaps with a virtual reality glove for true interaction with information or entertainment. The appliance will be a hybrid of phone, computer, and TV. Despite the scrambling to position themselves in a vertical market, businesses are not sure the public really wants a home information appliance. Videotex and other failures have taught communication companies a lesson. Surveys testing demand for interactive televisions have conclusively shown that the majority of consumers aren't interested enough, even after the potential of the technology has been explained to them. The market simply isn't there, even if an affordable price can be developed. The home information appliance may simply remain vaporware.

For that matter, technological hype is wearing on the public. A recent study found that buying a computer today is second only to buying a car for experiencing buyer's remorse. The feeling that a computer's value will depreciate as rapidly as driving a new car off the dealer's lot may have a significant impact on pricing and sales. If consumers continue to expect more and more for less and less, businesses may never be able to develop an affordable product. Libraries gearing up for home delivery of information may find the end users lack the equipment. The rude awakening that the Internet is not free, or the advent of advertising to recover costs will not help. Can you imagine a library transmission of data to the home being interrupted by advertising?

Censorship/Privacy

Before the library can become the gateway for electronic delivery of information, censorship and consumer privacy issues remain to be resolved. According to a recent poll four out of five American adults are very or somewhat concerned about threats to their personal privacy. This is the highest level of concern since 1978.

For purely technical reasons it is impossible to censor the Internet at present. "It's designed to work around censorship and blockage." "If you try to cut something, it self-repairs."[10] The reason is simple. Designed to withstand a nuclear blast, the Net was built without a central command authority. That means that nobody owns it, nobody runs it, and nobody has the power to kick anybody of for good. There isn't even a master switch that can shut it down in case of an emergency. It's the closest thing to true anarchy that ever existed. As a result, authoritative databases, such as library catalogs ride side-by-side with pornography, hate mail, advertising, sexual harassment, hot chat, unwarranted jokes, virus wars, and more. Internet bashing prompted by questionable communications will not help the NII agenda.

Currently, objectionable practices or offerings on the Internet are more or less self-regulated. The problem is that no real rules of the road exist, thus what is objectionable to one person is normal fare for another. Bulletin boards and e-mail constitute the bulk of questionable transmissions. For example, a bulk advertising practice termed "spamming" posts an add on almost every active bulletin board, ensuring that it will be seen by millions of users. In Internet jargon, "spamming the net" means to evoke the effect of dropping a can of Spam into a fan and filling the surrounding space with meat. Cyberjunkies disagreeing with this practice become vigilante censors by generating "hate mail" in response. This censorship practice is termed "flaming". Other flaming techniques make the undesirable sender's fax machine spew out page after page of blank paper, sending phony request for information, or Net vets send in ad-seeking cancelbots to zap the commercial pitches. While "flaming" may be a quaint self-regulating technique, it further jams up the channels. Cybernerds also flame new arrivals, especially those who do not read the frequently-asked questions (FAQ) files or bother to learn its strange customs or language, and anyone that openly defies them. A whole new culture with its own "netiquette" has arisen.

Companies are now just beginning to develop policies for electronic mail. Eastman Kodak has had to deal with employees running a business or spot advertising on the Internet with a company mailbox. The company's employees send approximately 400,000 messages per day internally or over the Internet. It is difficult to balance freedom of expression with prudent business practices. Vinton Cerf, president of the Internet Society, says he and his colleagues are preparing a set of voluntary norms they hope will put restraints on objectionable e-mailers.

On a side note, e-mail is reminiscent of an old army practice called "hurry up and wait." One of the biggest advantages of e-mail is the speed of electronic transmission, only to have messages sit in electronic mail boxes waiting to be read. Messages queue up to the extent that programs called bozo filters and kill files have been developed to sort out the junk mail. Voice and snail mail still serve a purpose.

The closest formal method of maintaining privacy is the U.S. government's proposed Clipper Chip. The Clipper Chip is an encryption system for encoding and decoding phone calls and e-mail so that they are protected from snooping by everyone but the government itself. Cyberjunkies actually welcome the Chip but resent that the government has the back door key. Some people feel that the FCC is the appropriate cop to regulate what is transmitted on the superhighway. The FCC, which oversees U.S. airwaves, has no jurisdiction over the Internet. In fact, there is no overall governing body. The question is still being debated as to whether the Internet is more like a public broadcast system such as television or radio, and so subject to control, or more like the telephone system or the mail, which have greater freedoms over the content of messages.

The Role of Libraries

Let us take a closer look at the role of libraries. As a result of technological progress it has been predicted that current libraries and research tools will be obsolete in 20 years. A long-range prediction of anything technologically-driven appears to be foolhardy, but it might be worth addressing the question, "has technology caught up with libraries?" That is, have libraries done all they can with technology, and will newer developments supersede library services? For example, will publishers supply directly to the home, and bypass libraries?

Within constraints of physical resources, it would be remiss to argue that librarians have not used technology effectively. For that matter libraries were the proving grounds for many technologies, ranging from theoretical applications of operations research to bibliographic utilities, online search services, and CD-ROM. While Internet still remains an intellectual curiosity for many scholars, libraries use it routinely for reference service. Services such as Bulletin Board for Librarians (BUBL), are used to answer difficult reference questions called "stumpers", and Hytelnet lists access points to library catalogs around the world. Librarians have had a significant impact on Gopher and other access tools. In many universities the Gopher client and/or server is under the control of the library.

Sprint, and Smith Automation Systems recently demonstrated an easy-to-use computer service creating public library gateways to the Internet. The project, called Global Internet Library Connection, aims to make libraries full-service community information centers, providing access to electronic information as well as traditional recorded and print sources. "Newbies" intimidated by "flaming" may find this intermediary service welcome. Perhaps more progressing is the use of MOO (Multi-user Object Oriented) software for building virtual libraries. MOOs, or more correctly LambdaMOO creates a text-based, multi-user, interactive online environment which is available through the Internet.

The literature of librarianship makes a convincing argument that libraries are undergoing a paradigm shift toward what is termed the virtual library. Actually the problem is not with librarians making a paradigm shift. The biggest speedtrap on the information highway might be termed paradigm paralysis. What happens if library users, the general public, and funding agencies are unable to recognize or accept the library's ability to make the paradigm shift? The problem has been with us all along. No matter how librarians have tried, surveys indicate that the public's image of librarians has not changed. The public sees the library as a place for books, or they associate the library with the process of reading. The problem can only get worse as old readers die out, and the nintendo generation grows up. As access to research materials becomes available in the home, will scholars and researchers perceive any real value in the library? Will publishers and educators develop library paradigm paralysis as electronic publishing becomes a greater reality? What will the government's perspective be in light of technological changes? Will librarians become road kill, as we hitchhike down the information superhighway?

Libraries are process-based systems, and the roles they play in these processes must be marketed. Recreational reading may be an end-process in itself, but libraries also contribute to processes within education and research. If these roles are not clarified, other disciplines may begin blaming libraries for their ills. The library has been a black box for too many years. Perhaps it is time to re-examine basic assumptions underlying library service. One thing is for certain. Libraries must diversify, or they will atrophy. As suppliers and current users turn to other technological solutions, the library will be left to ponder its own misfortune. A quote from Dr. Doolittle, used by Robert Heldman in his excellent book on telecommunications, may fit the bill "Where are we going? I don't know, but we'd better decide, as we won't know when we get there, when we've arrived!"

Libraries are still in a position to develop game-theoretic alliances with education, publishers, and communications businesses, rather than managing to be swept along on their coattails. If libraries do not remain an integral component of the processes they support, libraries will be reduced to anthropological or recreational curiosities. Libraries need only to look at some of the sweeping technological changes alluded to by Vice President Gore. Isn't it odd that in a technologically-driven society where leisure time should be pre-eminent, people are so busy that we look to an increasing number of service agencies to fulfill our needs? Perhaps it is because the price of leisure forces us to work more, or that there are more things to do and buy. It may also be that an information society loses touch with reality.

The point is this. The library may well be positioned for rapid growth to fulfill various service functions. As information becomes more intangible by virtue of its electronic form, people will look increasingly to information analysts. The proximity and skills of the library to the information source can hardly be overlooked. After all, libraries were one of the first to develop sustainable networked information architectures. As the indexed "white literature" gives way to the grey and black literature, quality information filtering will become a necessity. Skills associated with library housekeeping positions that are lost to technology may be turned to new markets. Libraries need to expand training courses beyond those teaching the use of access tools within the tangible or virtual library. Consider, for example, CompUSA and other hardware/software retail outlets that routinely profit from one-day seminars on how to use hardware and software. The library needs to keep in mind that the information needy are not necessarily the financially poor. Greater emphasis should be placed on cost-recovery or profit-oriented strategies offering value-added services not presently allowed for in the traditional library model. For example, libraries could consider developing advocacy structures such as exist in some special libraries, the legal fields, or social service agencies.

The library would hardly be competing with education and other sectors. Consider the problem: An educator writes that "Standardized test scores have dropped significantly in the past 15 years; the rate of illiteracy has increased; innumeracy has been cited as a growing problem across the nation... and the ability to write and argue coherently appears to be declining among young adults... Yet this serious state of educational affairs ... has come about in an era of the Internet, and by extension, the computer revolution."[11] The problems carry over into higher education as these students go on to college. Even doctoral candidates have an increasing problem with the ability and will to write. Libraries need to consider these markets.

In the meantime, library associations are busy in the political arena. Coalitions are in place with the potential for library involvement. Yet somehow, there is the scary feeling that the library is only a token argument to further the goals of other disciplines. A speaker from the Coalition for Networked Information recently stated that only one librarian was included in the work on developing electronic identifier standards such as Uniform Resource Locators (URL), Uniform Resource Numbers (URN) and Uniform Resource Characteristics (URC). The American Library Association and four major educational associations recently presented the Federal Communications Commission (FCC) with a plan that uses regulatory policy to connect the nation's libraries and schools. The proposal would generate up to $300 million dollars from the rates charged by local telephone companies to long distance companies for access to their networks. The agenda needs to go beyond equipment funding, to include staff training and effective library research.

Conclusion

As Alfred E. Neuman is often quoted, librarians can also say "what me worry." Anyone new to the Internet can easily conclude that the future is not yet here. We are still essentially a print-based information society, with libraries holding the key stock. Without libraries, access to the many sought after sources is painfully slow, confusing, and in many ways primitive. Transparent, intuitive retrieval systems have a long way to go. For example, on the Internet, sometimes after painfully slow response times, one finds that the sources are no longer there, they have been changed or not kept up to date, or access is restricted or denied. Electronic mall barons such as MecklerWeb and Digital's mall of the Universe are putting out for rent signs but as one business executive was quoted "One dirty little secret on the Internet is that nobody's selling anything yet." There are few detailed demographic studies on whether Internet users really want to buy things electronically.

In the near future, information providers will continue to seek the library as a conduit for disseminating publications. While some of the housekeeping chores in libraries change, new services will undoubtedly develop. Based on our incomplete understanding of what constitutes information, and the social habits and reward systems long-engrained in the general public, the library will enjoy relative market stability. At the same time, if we are to be ready for the future, lest it speeds past us, libraries must consider themselves as knowledge engines, staffed by human knowbots, rather than the paradigm of electronic bookstores staffed by clerks. As the marines say "no guts no glory". Whether libraries can avoid the speedtraps and the fines and race on to glory remains to be seen.

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Internet One : The Binghamton University Libraries' Interface to the Internet

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Abstract

In March 1991 the Binghamton University Libraries introduced use of the Internet to the reference desk as part of the "Reference Librarian's Workstation." On April 9, 1993 the Libraries introduced "Internet One," a computer-based system created by the Libraries' Systems Office and Information and Research Services staff to provide library users with easy access to selected information resources on the Internet such as library catalogs, electronic journals, bibliographic indexes, table of contents and document delivery services. The initial stages of the process and the reference librarians' early reactions to the system have been discussed by Jill T. Perkins[1]. This paper elaborates on the choices made in designing the system, reports on how the service was received by staff and library clients, describes changes made in response to these observations, and describes how the system affected information service. Plans for the future are described.

Introduction

Binghamton University, one of the four Ph.D.-granting universities of the State University of New York system, is located in the Southern Tier of New York (**Figure 1**). It has an enrollment of 12,000 students, 9,000 of whom are undergraduates. A faculty of 600 offers instruction in 40 disciplines, 17 of which lead to the doctoral degree. There are two libraries - main and science-engineering - with holdings of approximately 1.4 million volumes. The Libraries are staffed by 102 people, 26 of whom are librarians with faculty status. Reference service is provided by 22 full time equivalent (FTE) staff in the Information and Research Services Division.

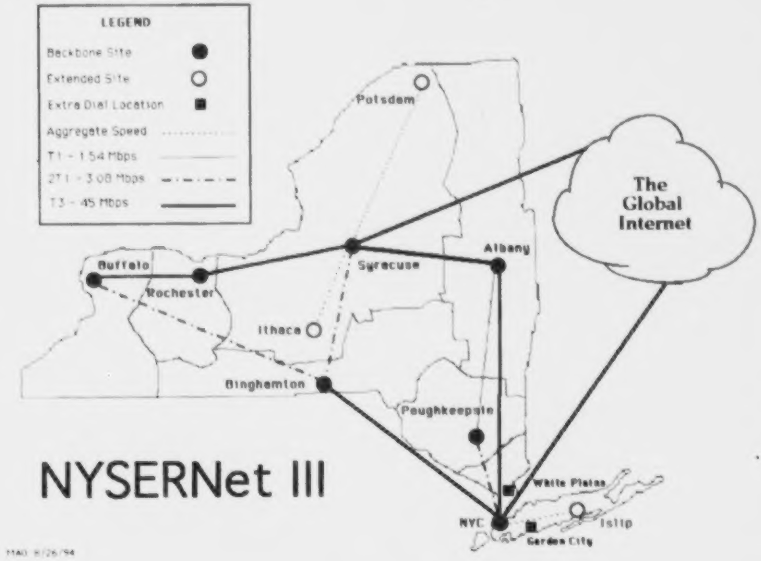
LEGEND
Backbone Site ●
Extended Site ○
Extra Dial Location ■
Aggregate Speed
T1 - 1.54 Mbps
2T1 - 3.08 Mbps
T3 - 45 Mbps
Potsdem
The Global Internet
Albany
Syracuse
Buffalo
Rochester
Ithaca
Binghamton
Poughkeepsie
White Plains
NYC
Islip
Garden City
NYSERNet III
MAD 8/26/94

Figure 1

It is hard to remember what life at the reference desk was like before the introduction of Internet information resources only four short years ago. Our work with the Internet may be described in three phases: first, use of the Internet by the reference staff at the reference desk; second, hands-on access to the Internet in the Libraries; and third, increased education and

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training. Each phase was characterized by a new and important strategic alliance or partnership: in Phase 1, with the staff in the Libraries' Systems Office; in Phase 2, with Academic Computing; and in Phase 3, with the teaching faculty.

Until the introduction of electronic information resources, reference service at Binghamton would have been familiar to a university reference librarian in the 1930s: reference service offered from a reference desk in a reference room containing a large reference collection.

After four years of using the Internet and other electronic resources, we talk about a new paradigm of user-based reference service involving remote access to information resources, promotion of user self-sufficiency, and collaborative partnerships with users and the teaching faculty.

Phase 1. Reference Librarian's Workstation

The Binghamton University Libraries' involvement with the Internet for public service began in March 1991 when we installed an IBM X-terminal and X-Windows software at the main library reference desk. By doing so, we not only improved our effectiveness and efficiency at the reference desk but we also alleviated our cramped workspace because we no longer needed the "electronic pinball arcade" of terminals dedicated to individual databases like RLIN, OCLC, and our OPAC.

Electronic information resources including our NOTIS-based OPAC, NOTIS MDAS files, RLIN, OCLC, and Cornell's OPAC, word processing, and electronic mail were brought together on one CRT screen as "icons" that could be opened with the point and click of a mouse. X-Windows software allowed reference staff to do "multitasking," that is, to have simultaneous access to multiple databases or applications. Electronic mail could be running at the same time a staff member was connected simultaneously to the local OPAC and to the Cornell catalog. This capability could be used to answer electronic mail reference questions. Bibliographic citations from our OPAC could be cut and pasted into the library pathfinder guide for editing during a slack period at the reference desk. Or a search with zero results in the local OPAC could be exported and executed in the Cornell catalog without rekeying. Cornell's large research library collection is a short drive from Binghamton, and our clients have privileges there.

I will not go into detail about the technical side of the system, because a recent paper by a former colleague gives these details and I recommend it to you[1]. Instead, I will concentrate on our planning strategies and the impact the Internet has had on public services, particularly on the provision of reference service in our libraries since that fateful day in March 1991.

While it was originally conceived as a "reference librarian's workstation," with the idea that reference staff would use the word processing and electronic mail features extensively while at the desk, the reference librarians used the X-terminal almost exclusively for connecting to Cornell's catalog and to the RLIN database. In other words, it was primarily used as an "enhanced OPAC."

Phase 2. Internet One

It was not long before the reference librarians realized it would be a definite service improvement to offer the enhanced OPAC directly to the public without reference staff intermediation. Clients frequently asked why they could not search the Cornell catalog or RLIN by themselves. Allowing them to do so became the second phase of our work with the Internet, the creation of what came to be known as Internet One. A group of "electronic change champions" called the SWAT Team was appointed to steer the project to completion. The term "SWAT" is used for emergency response teams in the United States, and speaks to our sense of urgency at the time. The ten-member group was composed of reference librarians, unit heads, and library systems staff members.

It took us about nine months, from September 1992 until April 1993, to design and implement the new service. In that time the amount of information available via the Internet and the tools for making sense of it increased dramatically. Information resources included not only millions of records of bibliographic information from hundreds of OPACs all over the world, but also tens of thousands of citations to periodical articles from commercial table of contents and document delivery services like CARL Uncover II, OCLC's FirstSearch, and RLG's Inside Information. There were full text files of hundreds of electronic journal articles and entire books from Project Gutenberg, as well as unimaginable numbers of other files and applications loaded on computers all over the world. Happily at the same time we discovered Internet navigation tools such as Gopher, Archie, Veronica and WAIS to make connecting to many of these sources less difficult. Clearly, our narrow conception of the new service as an "enhanced OPAC" had to change.

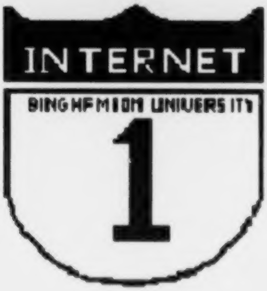


Figure 2

We decided to call the new service "Internet One" and designed a logo to resemble an interstate highway sign to take advantage of the Information Superhighway metaphor, which seemed fresh to us at the time. (**Figure 2**)

We decided on eight significant design features.

1. We wanted the system to be as easy to use as possible and also take advantage of the graphical user interface, multitasking, and multiple session features we liked on the Reference Librarian's Workstation.
2. We wanted the system to be used for access to Internet-based library information, not for electronic mail, file transfers, access to bulletin boards, or stand-alone computer applications like word processing. All of these are available in the computer laboratories operated by Academic Computing.
3. We wanted to select a limited number of important library-type information resources from the vast reservoir of Internet information. We wanted to create a system that would help our clients and ourselves cope with the experience of "drinking from a fire hose." The intended audience for this service was to be advanced level graduate students and faculty researchers because they were most likely to need citations to scholarly and research-level articles and access to remote and perhaps esoteric information.
4. We wanted the system to be an in-house facility because reference staff mediation and proximity to the paper collection were important. Having the service in the library made the point to our clients that the

Internet was not sufficient to provide complete information service: most information and access to that information resides in paper documents, and thus it is important to use both electronic and paper tools. Further, we wanted to make the point that the reference staff play an important role in selecting, "filtering," and interpreting Internet-based information, getting back to the "fire hose" analogy.

5. We decided not to connect printers to the terminals because we wanted to encourage our clients to use electronic methods to capture and transfer electronic information. The Libraries Systems Office-designed mailer features in support of this rationale.

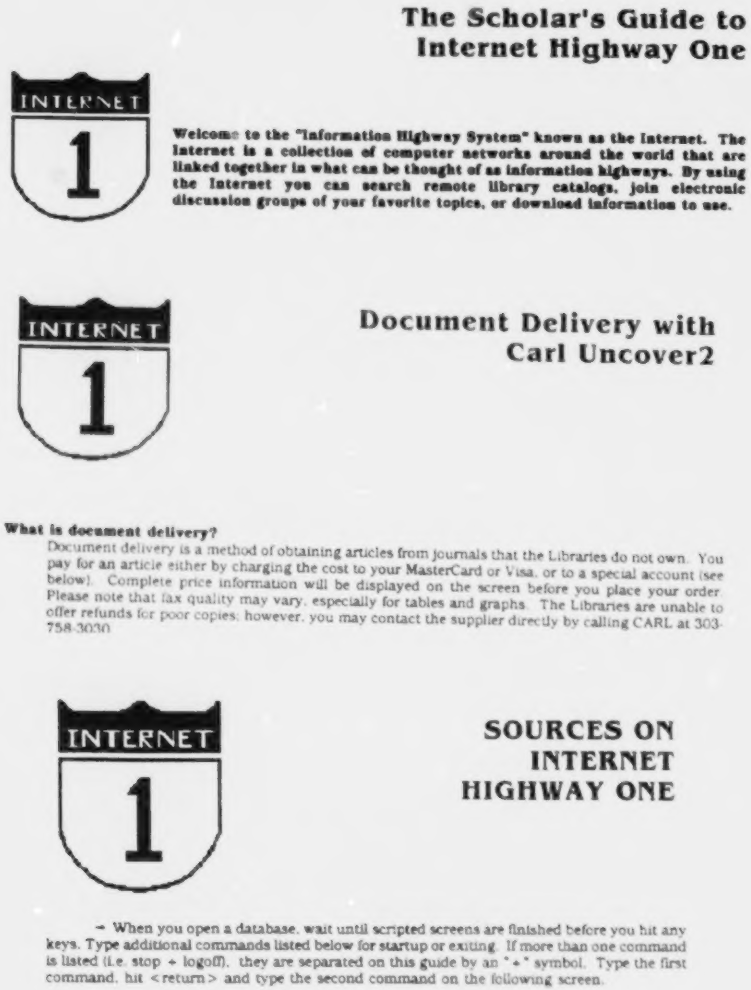
6. We liked the idea that users would discover as much as possible about how to use the electronic system from the electronic system itself. Consequently, much effort went into the "Help" and "About" and "What's New" files. And we did produce paper guides, just to be on the safe side (**Figure 3**). We further decided against a requirement that prospective users undergo a training session for "certification" before being allowed to use the system. We wanted to make the system as easy to use as possible, with a minimum of staff mediation, because we lacked adequate staff to do individualized orientations and trouble shooting for the new system.

7. We wanted to limit access to the pay per search services like OCLC's FirstSearch because of reports at that time from other libraries that unlimited access resulted in a sharply rising cost curve. We simply did not have the money to fund such access.

8. We wanted the system to be flexible so that it could grow and change, based on changing information resources, experience with users, and our own desire as librarians to better organize and describe the resources on it. To achieve this, we planned to evaluate the system periodically, using objective and subjective measures.

Finally, we wanted to do a good publicity campaign to launch the new service, realizing that it would be a failure if no one knew about it. Furthermore, the publicity would enhance our image as dynamic and forward-looking information providers. Our reputation as a strong library with effective services helps us get needed resources and helps the University to recruit good faculty and students.

We installed six Internet One NCD X-terminals in the main library and six in the science-engineering library and announced their availability to the



INTERNET
1
INTERNET
1
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1

The Scholar's Guide to Internet Highway One

Welcome to the "Information Highway System" known as the Internet. The Internet is a collection of computer networks around the world that are linked together in what can be thought of as information highways. By using the Internet you can search remote library catalogs, join electronic discussion groups of your favorite topics, or download information to use.

Document Delivery with Carl Uncover2

What is document delivery?

Document delivery is a method of obtaining articles from journals that the Libraries do not own. You pay for an article either by charging the cost to your MasterCard or Visa, or to a special account (see below). Complete price information will be displayed on the screen before you place your order. Please note that fax quality may vary, especially for tables and graphs. The Libraries are unable to offer refunds for poor copies; however, you may contact the supplier directly by calling CARL at 303-758-3030.

SOURCES ON INTERNET HIGHWAY ONE

→ When you open a database, wait until scripted screens are finished before you hit any keys. Type additional commands listed below for startup or exiting. If more than one command is listed (i.e. stop + logoff), they are separated on this guide by an "+" symbol. Type the first command, hit <return> and type the second command on the following screen.

Figure 3

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public in April 1993. From these terminals library users access two dozen selected remote information resources using a graphical point and click interface. As Jill Perkins explains in her paper, the initial menu system is an X-client based on the WidgetCreation Library Package and the Athena Resource Interpreter. All scripts for remote sessions are in the Expect language. The first screen is divided into three columns — Online Library Catalogs, Other Internet Resources, and Utilities. (**Figure 4**)

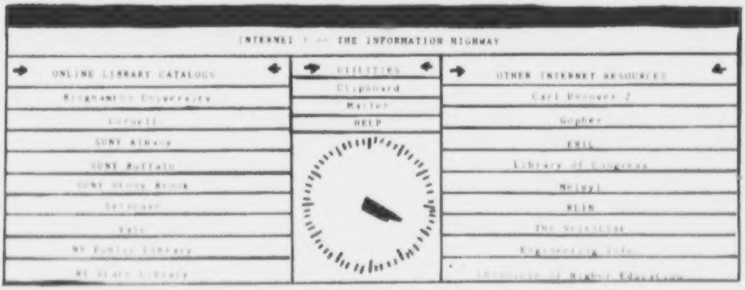
INTERNET I -- THE INFORMATION HIGHWAY
ONLINE LIBRARY CATALOGS
Binghamton University
Cornell
SUNY Albany
SUNY Buffalo
SUNY Stony Brook
Yale
NY Public Library
NY State Library
UTILITIES
Clipboard
Mailer
HELP
OTHER INTERNET RESOURCES
Carl Uncover 2
Gopher
ERIL
Library of Congress
Melvyl
RLIN
The Scientist
Engineering Info

Figure 4

As with all such projects, the outcome was somewhat different from what we expected. The new service affected our staffing patterns, committee structure, and how we work on the reference desk. Two new positions, Reference and Instruction Librarian and Collaboratory Librarian, were created in the main library. These changes will be discussed under Phase 3 below. The Director of Libraries created a Committee to Plan the Electronic Delivery of Information (CPEDI) to replace the Library Automation Advisory Committee (LAAC). This acknowledges the change in emphasis in the Libraries from integrated library systems to remote access to information systems. Lastly, a permanent standing committee called ACID (Advisory Committee on Internet One Development) was appointed to replace the SWAT task force.

It may be symbolic that reference staff now spend slack time at the reference desk surfing the 'Net or consulting with each other around the terminals rather than selecting from publishers' catalogs or scanning the horizon for clients. Reference staff are also performing different functions in the reference room, away from the reference desk. Considerable time is spent not only helping clients use the Internet One system, but also working with

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the equipment. Terminals must be logged in and out, "frozen" equipment dealt with, and files "de-iconized" or closed after clients leave the terminals. Staff at levels from undergraduates to faculty librarians are involved in providing this service, which is a change from the original concept.

While we did not do the kind of evaluations we envisioned in the design phase, we did study the system use logs. The bar charts in **Figures 5** and **6**, generated from these logs, show which of the information resources were most heavily used and the pattern of use from October 1993 to June 1994. The data from January 1994 are not available.

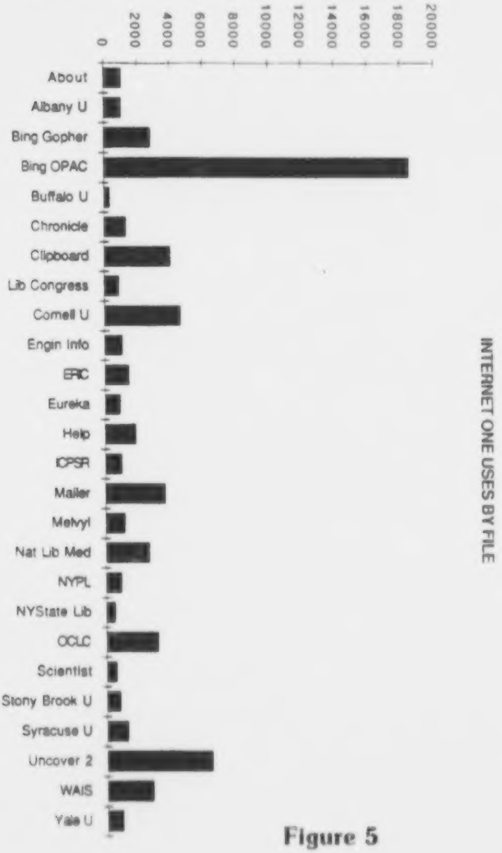


Figure 5

We were somewhat surprised that the most used file by far is the Binghamton Libraries' OPAC and not any of the Internet resources. One conclusion is that users are moving successfully from Internet-based bibliographic databases to the Binghamton OPAC to determine if items are held locally. Another possibility is that the system has succeeded to provide additional and much needed OPAC terminals for our clients. If finding out what is in the Libraries' collections is the main information activity of undergraduates, who are the Libraries' primary clientele, and this activity is also the main information activity on Internet One, another conclusion may be that the actual audience of Internet One is our undergraduates, not our planned audience of graduate students and faculty.

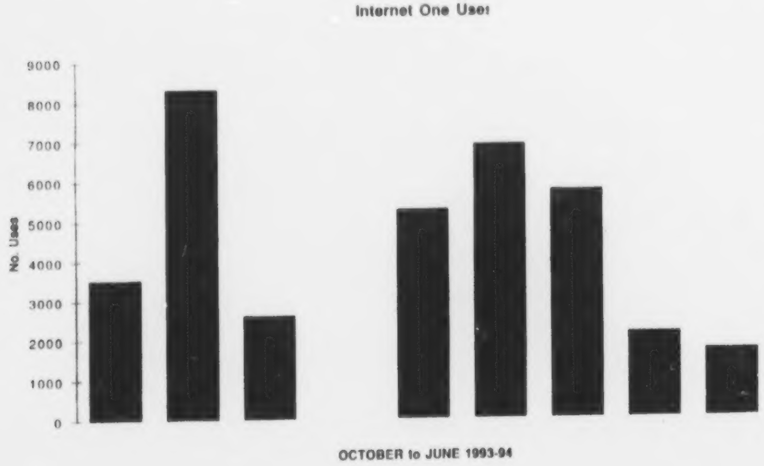
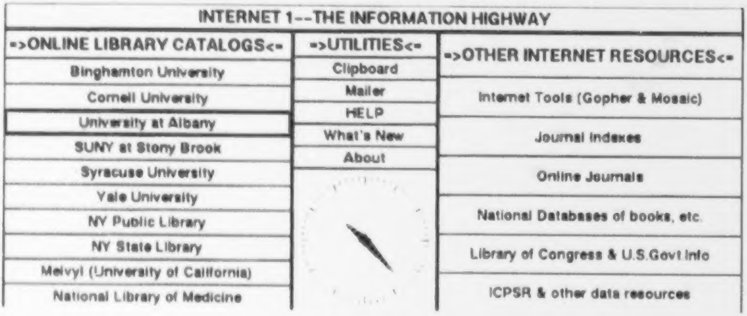


Figure 6

The system has proved to be fairly easy to use on the technical level. Clients have little trouble using a mouse and, with the notable exception of failing to log out of their sessions, we find they have little trouble with the basic mechanics. Based on the fact that these utilities were among the most heavily used menu items, we were pleased to see that our clients seem to have found the mailer and the clipboard.

We have tried to meet our goal to be flexible. The layout, contents, and functionalities underlying the Internet One menu screen have evolved over



INTERNET 1--THE INFORMATION HIGHWAY

=>ONLINE LIBRARY CATALOGS<=
Binghamton University
Cornell University
University at Albany
SUNY at Stony Brook
Syracuse University
Yale University
NY Public Library
NY State Library
Melvyl (University of California)
National Library of Medicine

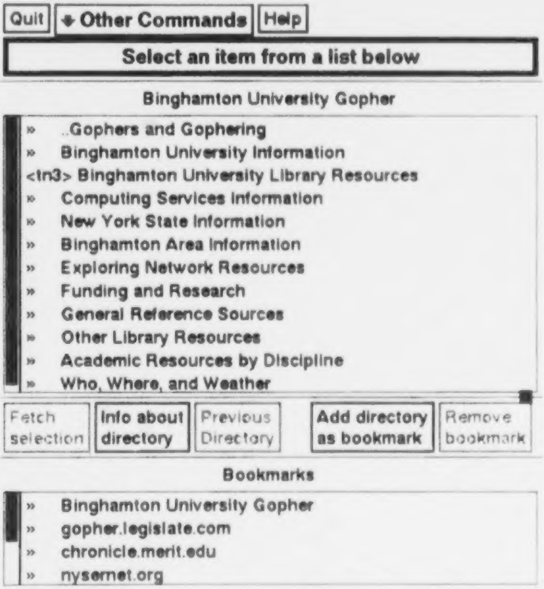
=>UTILITIES<=
Clipboard
Mailer
HELP
What's New
About

=>OTHER INTERNET RESOURCES<=
Internet Tools (Gopher & Mosaic)
Journal Indexes
Online Journals
National Databases of books, etc.
Library of Congress & U.S.Govt.Info
ICPSR & other data resources

Figure 7

time. **Figure 7** shows what the screen looks like now. Changes in screen layout can be seen by comparing it with **Figure 4**. "Melvyl" was explained to show it is the OPAC of the University of California Libraries, and Melvyl is now listed where it belongs under "Online Library Catalogs," rather than under "Other Information Resources." Information resources are now arranged under broad headings like "National Databases of Books," "Journal Indexes," "Online Journals," and "ICPSR and Other Data Resources". This was done to help users when we discovered they were "surfing" Internet One to discover what the various files contained. The need to resort to a phase like "Other Data Resources" reflects to some extent the difficulty in categorizing the many kinds of information available on the Internet. We also made a separate entry for "Internet Tools" to help our clients find their way around the Internet. Our system connects directly to the Binghamton University Gopher System (BUGS) and we maintain the BUGS submenus entitled "Other Internet Library Resources," "General Reference Tools," and "Resources by Academic Discipline" on the Libraries' server (**Figure 8**). This demonstrates the new partnership with Academic Computing Services that emerged in Phase Two. The Libraries' work with Computing Services to implement a shared databases project on a distributed model using Z39.50 and the Internet is another example of this strategic partnership.

We have managed to keep expenditures for the pay-per-use services within acceptable limits because we limited ourselves to only one, and it is available on a relatively small number of terminals only in the Libraries. The number of uses of FirstSearch follows a bell shaped curve (**Figure 9**), not



Quit | Other Commands | Help

Select an item from a list below

Binghamton University Gopher

» ..Gophers and Gophering
» Binghamton University Information
<In3> Binghamton University Library Resources
» Computing Services Information
» New York State Information
» Binghamton Area Information
» Exploring Network Resources
» Funding and Research
» General Reference Sources
» Other Library Resources
» Academic Resources by Discipline
» Who, Where, and Weather

Fetch selection | Info about directory | Previous Directory | Add directory as bookmark | Remove bookmark

Bookmarks

» Binghamton University Gopher
» gopher.legislate.com
» chronicle.merit.edu
» nysernet.org

Figure 8

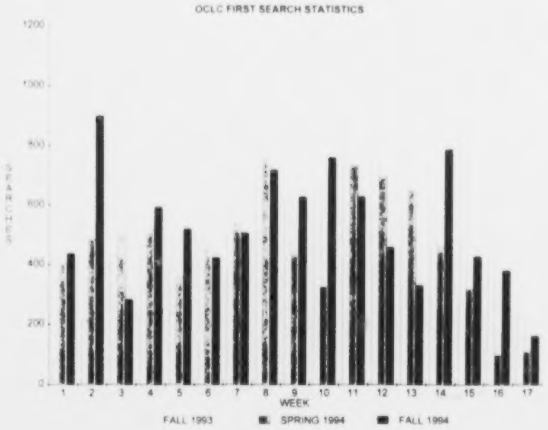


Figure 9

the "going off the chart" straight line we feared from some other libraries' reported experiences.

Internet One may have some negative aspects for our users that we should address in future if we can. We have not succeeded in integrating all our electronic information resources with an effective retrieval system using a single effective command language. Instead our clients must distinguish among OPAC terminals, CD-ROM terminals, and Internet One terminals, all of which have different contents and use different command languages. Secondly, while we have improved data capture and data transfer, we have done little with data manipulation. An improvement to service might be the integration of the kind of functionality available in bibliographic applications like ProCite. Lastly, our users are often disappointed that Internet One does not deliver full text from OPAC or index citations. This integration will be the next real breakthrough in electronic service.

As Jill Perkins pointed out in her paper, the ability of the Internet to answer reference questions is limited, and we are still feeling our way toward an understanding of when its use is appropriate. We feel strongly that we have an important role to play in working with clients to identify, interpret, evaluate, and "filter" information from this burgeoning welter. It is becoming a standard source for some kinds of current events and contemporary issues questions, and we tend to use the bookmark feature to connect to sources that answer frequently asked questions. Bibliographic information and preprints available on the Internet are very useful in the fields of science and technology. Our history bibliographer finds Internet resources less useful, and another humanities subject specialist refers to its content as "entertainment." Despite the drawbacks, the overall impact of the new service on the public has been positive. It has met our objective to open up the Internet "information superhighway" to our clients.

Phase 3. ELVIS

No matter how "easy to use" electronic-based information systems are supposed to be, reference librarians say they spend more time with each client because it takes time to get the novice user started using the OPAC, the CD-ROM LAN, or Internet One. Not only are reference staff educating users about complex information systems, but the instruction also includes how to use the equipment.

To address this situation this Fall we started a series of hands-on instruction sessions scheduled in advance in classroom settings. We call this service "ELVIS" for Electronic Library Vital Information Systems. The program was designed by two reference and instruction librarians. They say that "Elvis has been spotted in the Libraries." This enhancement of the bibliographic instruction program was designed to address the instruction issues the new technology brought us. The position of a Collaboratory Librarian was also created, about which more later.

We have added access to NCSA's Mosaic home page to Internet One, and we will be creating a Mosaic home page for the Libraries, which will include links to local library information, the text of the Libraries' information guides or pathfinders, and other remote World Wide Web resources.

Perhaps the most important impact the Internet and other electronic information resources have made in our conception of our role as university librarians is the realization of the growing importance of instruction and teaching. We are consciously moving from terms like "demonstrating" and "training" toward "educating" and "instructing." In addition to the traditional library-sponsored sessions to introduce Internet One basics aimed at all comers (ELVIS), and subject-based course-integrated instruction sessions, we have developed what we call the Collaboratory concept of an equal partnership with teaching faculty to design and teach courses offered for credit in the departments. We have identified over seventy courses with current affairs or contemporary issues content that would be improved by the introduction of Internet electronic information resources and collaboration with international educational site partners. This concept goes beyond course-integrated library instruction and the collaboration involved between librarians. Working with faculty is the third and most provocative partnership to emerge from our involvement with the Internet. It calls for a paper to itself.[2]

Conclusion

The changes brought on by the information environment surrounding the Internet have prompted us to engage in a facilitated self-study to look at what services we should provide in the foreseeable future and how we will be structured to offer them. We know that our world is undergoing a paradigm shift; we know that the characteristics and needs of our users are changing. We know that the world is shrinking and that this calls for a global viewpoint. Working with the Internet has shown us that change is built into our environment and that we must learn to work with it.

We believe we have stimulated and benefited our clients by offering them easier access to electronic information and new information retrieval possibilities. One of our goals as university librarians is to teach Binghamton University students to be information virtuosos who can "play electronic information systems like violins." We feel this is important to them as students and in their future professional lives in the information age. Our commitment to giving students experience with the newest information technologies, sometimes ones we have designed in house, may put us on the uncomfortable cutting edge of technology, but we are convinced it is worth it.

Perhaps the university librarian from the 1930s mentioned at the beginning of this paper would not be very surprised at the way university libraries are responding to the new information world. The underlying commitment is still the same, after all: it is to give high quality service. That has not changed.

Acknowledgments

I am grateful to Rachel Cassel and Andrew Perry of the Binghamton University Libraries and to Jill Perkins of the Chiat-Day Intelligence Center who made useful comments about this paper. Prudence Stelling, Rachel Cassel, Andrew Perry and Mary Harper also helped with the figures. Rachel and Andy served on the SWAT with Jeanne Eichelberger, Suzanne Fedunok, Rachelle Moore, Mary Moulton, Jill Perkins, Martin Raish, Eunice Roe, and Keith Roe. ACID is chaired by Rachel Cassel and the other members are Mark Colvson, Susan Hensley, Mary Moulton, Andrew Perry and Prudence Stelling. ELVIS was designed and first taught by Mark Colvson and Karen Shockey.

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Highways and Backroads of Internet : Strategies and Tactics

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Lisbeth Björklund got a B.Sc. in mathematics and biology in 1981. From 1982 to 1988 she worked at Linköping University Library, mostly at the ILL department; in 1984 she was educated as assistant librarian. Since 1985 she is research assistant and doctoral student in Informatics at LIBLAB.

She participated in planning and lectured in courses in the undergraduate "Informatics" programme ("Electronic media, technology, use, consequences", and "Information Resources in Societies") since 1992. Lisbeth Björklund was guest lecturer in "Hypermedia" at the Swedish School of Library and Information Science from 1992-93.

Abstract

Highways are useful when you know where to go and you want to get there, and back, as fast as possible. One of the problems is that when you want to go you will probably get trapped in the traffic since many other want to go at that time using the same route.

If you don't know where to go, or what to look for, or when the travel is more important than getting there, the backroads might

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* The paper was presented by Lisbeth Björklund.

be better. Going off the highway and on to secondary roads and the backroads increases the need for detailed maps. On the highway there are signs: telling you which way to go, how far it is, and where to get off, but only for the major locations. On the backroads signs are often more haphazard, but on the other hand it's easier to get on speaking terms with people who can tell you what's interesting, and how to get there.

This paper is about strategies and tactics for choosing the right type of way in different situations, about tools that are needed and/or missing. It is also about how librarians and information scientists might help; by providing tools for making tools, access to tools, and material for tools to operate on.

1. Highways and Backroads

> "We want to make good time, but for us now this is measured with emphasis on 'good' rather than 'time' and when you make that shift in emphasis the whole approach changes."[1]

This quote from Pirsig denotes the difference between regarding information seeking as a process or regarding information as a product. Researchers often regard the information seeking process as part of the continuous process of building new knowledge. In that case it is not necessarily so that the highways are the best roads to choose since much of the new and interesting findings appear in the backroads. Highways are good since there are several lanes in the same direction, and no meeting traffic. On the electronic highway we are not disturbed by the meeting traffic, and the electronic highway might be defined as the source to which many lanes lead, i.e. (re)sources pointed to by many other (re)sources.[2]

There are about 3.846.000 hosts on Internet today.[3] If you study the different guides and compilations of resources on the Internet available for purchasing today[4], you'll find that most of them point to the same set of resources. These pointers constitute the electronic highways for fast access to information. If you want to find information not included in this small subset, it is often a question of trial and error. User education of the kind you can find in e.g. libraries, where the users are taught not only how to master different tools, but also which tool to use in a certain situation, and other information searching strategies, is not available for Internet users today.

In order to be able to use Internet today, as a cost-effective resource, and find the relevant information[5], whether it is on the highway or in the backroad, careful planning is needed. There are as yet very few studies on the actual use of the net, except for measurements of access to different sources[6]. User studies focusing on information behaviour, what kind of strategies and tactics people employ in using networked resources, is an important research area for the near future. These studies are needed as a platform, both for the development of educational material and for tools for retrieval and presentation of information.

In order to be able to use Internet in the future, as a cost-effective resource of information, we need better descriptions of sources and resources on the net. Another important research area is hence description, organisation and presentation of dynamic information.

These are traditional research areas in library and information science. Much of the work that is done today takes place in other disciplines, like computer science. Technicians organise and present information. In a Swedish local newspaper a columnist recently wrote: "The fastest growing niche in computing is the net information specialist's"[7] (author's translation). This should make all kinds of professionals in library and information science react, since they are the ones that have the experience and knowledge needed.

This paper discusses how to survive today in an anarchistic network, and what kind of research and development is needed in order to facilitate future use of the networks.

2. Anarchy or Structure?

This part discusses the reasons for the chaos we experience today, and how a semi-structured working-style can help us in using the Internet as a cost-effective information (re)source. The many books about Internet that are available today mostly present the available tools and some of the sources that can be found on the net. There is very little about how to act in different situations in order to find information.

2.1 The Situation of Today

"We has met the enemy, and it is us"[8]

One of the main reasons why finding information on the net is problematic is the underlying philosophy of anarchy. The net should be a free medium where anyone might both produce and consume in the way they prefer. There is little control, and no fees, information should be free, just as the cyberpunks declare. This fact that we don't pay for the information, just for the computing time and communication facilities, implies that we can't claim anything about the quality or presentation form of the published material. Since every user is free to publish, and does it, the users are the ones who are constructing these problems themselves.

All people are different, not only are there differences between individuals, but every single individual also performs differently in different situations. Not even when we try to standardise and try to make people act and think in the same direction do we succeed. One example of this is when indexers apply indexing terms to documents. Even if we try to get consistent descriptions by using standardised tools like thesauri, the interindexing consistency is sometimes low. Even the intraindexer consistency, the performance of one individual indexer measured over time, varies. We have different working styles, which sometimes might be very irrational. The fact that we have difficulties in finding information doesn't imply that we, when we are publishing material, consciously try to make it easy for other people to find it.

Our needs also differ from time to time. Sometimes we need information fast and we don't really care if it is exact, and other times we are very concerned with the quality and appropriateness of the information. This leads to different decisions about the kind of strategy and tactic to apply.

What we have access to today for mastering change, in its different forms on the net, are tools and techniques developed to describe and manage static information. In designing and building them we presumed that what is there today will also be there tomorrow, in the same place and with the same appearance. This is not the case on the Internet and we lack tools to master continuous change.

One way to make use of the available tools, trying to survive this chaos, is to use them in a strict and carefully planned manner. This can give us some control, and help us in our management and understanding of the information flow on the net. One model for this is the use of strategies and tactics.

2.2 Why Strategies and Tactics?

Studies of information seeking behaviour in traditional environments show that people use different strategies in order to accomplish different tasks or comply with different goals.[9] What then is a strategy?

> "strategy = Generalship, the art of war; management...as to impose upon the enemy the place and time and conditions for fighting preferred by oneself"[10]

A strategy is thus a long-term plan of how to win the war, and how to do this in a way that suites yourself. In the context of this paper a strategy would then be a long-term plan of how to manage and find information according to your own preferences. These strategies are based upon perceived needs as well as on knowledge about different sources. Different strategies may be formulated according to different goals, and strategies may vary over time. When used, the strategy is implemented in terms of tactics.

> "tactics = instance of, or plan formed according to this"[11]

Tactics is hence the way in which the strategy is implemented or the occasion of information seeking or other information behaviour tasks. A tactic for information retrieval includes decision upon which kind of tool to use, how to formulate the perceived need in questions etc.

All these decisions, both on strategy and tactics, are based on the individual working-style, and the perceived needs at different times and in different situations. The total information behaviour consists of a mix of strategies and tactics, applied when convenient[12], and must be studied as a process and not as an isolated session.

Strategies and tactics of this kind have been studied, as mentioned earlier, in traditional environments. In an electronic environment, such as the Internet - consisting of other types of documents, with other and more imperfect models for description, and other tools available - we lack such studies. We don't know if people try to apply their old strategies in this new environment and adjust the tactics to the circumstances, or if they construct totally new strategies, or if they work without strategies, ad hoc. Comprehensive user studies are needed in order to improve the possibilities to manage information on the net.

Below is an example of what strategies and tactics could be like, in the new environment, together with descriptions of some kinds of problems which arise when they are applied. This part is based partly on own experience in the LIBLAB group, and partly on experiences from our students[13].

2.2.1 Relations among Goals, Strategies and Tactics

As mentioned above, different strategies can be related to different goals. One goal might be to keep up-to-date in a specific subject area[14], another one might be to perform a single search for some specific information. The first goal will probably lead to the choice of a structured and carefully prepared strategy whilst the latter will probably lead to a more ad-hoc and simpler strategy, perhaps using brute force to browse search results for the wanted information. In the following example the goal is to monitor and keep up-to-date.

The tactics are of course depending on the strategy. With much simplification we will assume that the choice of a structured strategy is more likely to lead to the choice of structured tactics and vice versa.

2.2.2 Choice of Strategy and Tactic for Monitoring

The strategy is, however, adjusted to the goal. If the goal is broad, like general monitoring, it must be specified before the strategy is chosen. It is therefore important to decide whether it is highly specific research material that is of interest or common knowledge that is wanted. It is also a question of status. How much is known about the area, is it possible to attack known sources or is there a need to traverse from general to specific levels? Some of these choices are of course affected by factors such as time and cost restraints, habits etc.

An important distinction is, whether the aim is to start a process that will go on without active interference or to create a new habit of recurring performance of certain active procedures. This is a balance between effort and control. In the first case, which might take the form of subscriptions of different lists, no continuous, time-dependent effort is needed. Sorting of incoming material can be done at any time, even though if it is not done quite regularly there is a high risk of loosing control of the material. In the second case, which might be a plan for regular control of a set of (re)sources in order to register changes and additions, there is a need for continuous, active efforts, but the control of these parts is very good.

Another influencing factor is of course knowledge about different tools and tactics that might be used to implement the strategy. **Table 1** shows some examples of combinations of possible strategies and tactics.

Strategies	**Tactics**
top-down	collect maps
bottom-up	create maps
common knowledge	highways
specific information	backroads

Table 1: Some examples of strategies and tactics which might be applied to information seeking activities on the Internet

As an example, regard the following situation: I want to follow the development in an area which I'm initially not so familiar with, but my interest is in fairly specific and recent research findings.

Since I don't know the area, I don't have any points of reference to start from. The first strategical choice is to start on a general level and work towards the more specific, a topdown approach. My area of interest is quite narrow, and I'm interested in what is happening at the research front, so I'll seek specific information.

The tactic I choose to implement my top-down, searching specific information strategy will be to collect maps, preferably of backroads, which I find on my way. Navigating the net can take a lot of time. Guides and introductions to the Internet often concentrate on descriptions of different tools for searching or retrieving information, or on compilations of popular nodes in general or in a specific subject area. In addition to basic communication and search and retrieval tools, such as mail, ftp, Archie, Gopher etc., there are a lot of tools of browser type (Mosaic, MacWeb, Harmony etc.) which combine descriptions and overviews with searching facilities and direct access methods. What is not included in these tools is guidance on how to find different types of information, when it is most suitable to use different tools etc., what we here call strategies and tactics.

There are today no general agreements on how material that is published or given access to on the net should be structured or organised. Neither are there any agreements on description of the material. Map symbols pointing to different source material do not tell anything about the material, neither in a technical sense (format, media etc.) nor in a bibliographical (size, document type, author, version, date) or content sense. Due to this, inspection of every single potentially interesting document is needed in order to evaluate the relevance of the map. In our example the most interesting maps are those describing the backroads, i.e. local maps containing detailed information of contents or direct access to documents.

Local maps are usually quite well up-dated, since few middlemen are involved in the compilation. But the lack of agreements on map symbols might make it hard to interpret and understand the map. Usually you get no information about the level of the map, the correctness and coverage nor when it is up-dated and how often.

These shortcomings mean trouble as I am about to gather together different maps into an atlas of the area of interest. The tools that are at hand today only support the technical part of the compilation, they don't help me with descriptions, structures or organisation of the material. Most of the browsers available have some kind of tool which should help you build collections. There are tools for placing "bookmarks" or building "hotlists", i.e. collect pointers do different (re)sources. These are most often presented as linear lists, and the only way to structure the information is to build separate lists for different subjects. Some tools give the possibility to easily transform the hotlist to a HTML page, which has provided the possibility to comment and publish the compilation. There are thus many such compilations.

When the atlas is completed new problems arise, such as tracing changes and news. Material is moved to new addresses, new versions replace old ones, and material is removed. This problem has been recognised, and solutions like intelligent agents[15] are beginning to appear.

3. Towards a Structured Anarchy

This part focus some areas in which research and development are needed in the near future if we are going to be able to keep the net free for everyone to use and contribute to without creation of a total chaos that no-one can master or even utilise satisfactorily. These areas are presented as a couple of future professionals. For them to be able to perform well, research, education, agreements and co-operation are necessary. Pointers are also given to some work in progress.

3.1 Surveyors and Mapmakers

> Land surveying aims at e.g. to map the ground, divide it into legal entities and register those.[16]

The tasks of surveyors on the Internet is to map information, divide it into "legal" entities and register those. Mapping consists initially of identification, delimitation, description and registration of existing information, and thereafter of monitoring and registration of changes. This work is important not only from the retrieval aspect, but also for economic reasons, when questions of copyright and compensation are discussed.

Surveying is best done locally, following international recommendations and standards, in order to keep the workload down and the currency up. International agreements are important, so that everyone can access and interpret the information. The lack of agreements on descriptions has led to activities in working groups on the net and elsewhere.

An "Internet Engineering Task Force Working Group",[17] the "Uniform Resource Identifiers Working Group", is working on agreements on the content and presentation of the technical description of documents, e.g. format, address, size. The aim is to improve identification and retrieval of information. The preliminary documents that the group has published on the net reveals the insight of the importance of meta-data, i.e. data that can not necessarily be elicited directly from the document itself as an important part of such a description. Some parts of a traditional bibliographic description, author, abstract, are discussed in a preliminary document released by the group,[18] but discussions on full bibliographic and content-related descriptions which might contain a lot of meta-data are yet to be seen, and there are no models for registration of change, such as shift of physical address.

Another group, the "IRTF Research Group on Resource Discovery and Directory Service",[19] is working on the development of existing search and browsing systems like Archie, WAIS, Mosaic, in order to prepare the expected increase in users, data and types of systems. This group of four computer scientists discusses indexing as one solution that would increase the access. The documents available from the group show no signs of relation to information science and studies in this area.

Yet another approach is taken by OCLC by including descriptions in MARC-format into the library catalogue.[20] This means that they are not only surveyors, but also mapmakers, as they offer access to the information through the ordinary catalogue interface.

Mapmakers transform the surveyors results into maps that can be utilised for navigation. A very important research area is hence visualisation[21] of collections. Maps on Internet today most often mean subject oriented text/picture pages. There are also geographical maps with hypertext functions that takes the user to e.g. a web-side or a Gopher at a certain geographical location. But there is nothing that can be compared with the topographical map, which besides the location also gives information about size, type and relation to other items.

3.2 Road Safety Officers & Administrators

The primary responsibility for those working with traffic planning is to see that the traffic flows, and that people can travel where they want to in a safe and comfortable manner.

When surveyors and mapmakers together have supplied descriptions of the terrain planners can, taking into account the needs of the users, together with those responsible for traffic regulations and security decide where and how to build new roads to enforce the passability.

The first step is of course to investigate where people want to go and what their needs are. Many of our old roads were built where people made trails by walking on foot from place to place. Newer roads which are often both more secure and faster do not have this origin. They are instead adjusted to the new vehicles. A good road is created by studying and caring about the users needs, and combining this knowledge with knowledge about new vehicles and rules, provided that these in their turn have been adjusted to the users. Some people will probably prefer to go on using the old paths, so these must also be conserved.

The area of research in focus here is user studies. How do people use the net today? What can we do to give them a pleasant journey? How can we use this knowledge when constructing new vehicles? Where do we need to build new roads, and where is it enough with new and better signs, or an up-dating of the map?

We also need to study how people use the net in terms of strategies and tactics, because this can be a good base for future education. It's not only a question of mastering different vehicles, it's also a question of choosing the right vehicle for a special trip under certain circumstances.

3.3 Planners, Road Workers and Navvies

When the planning is finished the road must be marked, paved and signs put up. It must also be connected to other roads, at appropriate places. This practical work on the road never ends, it will need maintenance, new signs and new connections.

4. Conclusions

Traditionally, librarians and other related professionals have been the ones to perform the mapping, planning and construction work in the printed environment. Mapping by creating national bibliographies and catalogues of holdings in different places, planning by performing user studies to find out what kinds of tools are needed and which needs the users have. This has been transformed and integrated into the practical daily work in institutions like libraries and archives. Now, when we are entering the electronic world, technicians and computer scientists without tradition and experience are taking over this role. If we want a useful electronic world, existing in harmony with the old (and new) printed one, we need to regain some of the control and participate in developing a structured anarchy based on our experiences. Much of this work might, by research and investigations, form a good foundation for development of tools to be used by the users themselves. After all, users will probably like to have the freedom to, at least sometimes, "surf the net" for new experiences and still be able to assimilate and practically take care of what is found on the way.

"In philosophy, it is not the attainment of the goal that matters, it is the things that are met with on the way."[22]

References and Notes

1. PIRSIG, R.M. *Zen and the Art of Motorcycle Maintenance*. NY, Bantam Books, c1974, 22nd pr. 1979.

2. The whole metaphor is actually limping, because there are no roads on the net, or at least they are of less interest, it is the places that are important.

3. TREESE, Win , comp. *The Internet Index*. No. 4. Nov. 1994. URL: http://www.openmarket.com/info/internet-index/current.html. This is an estimation of the number of hosts on Internet the 7th November 1994. According to the same source all inhabitants of the world will be connected in the year 2003, if the growth rate keeps up.

4. A search in the Library of Congress Information System (browse file LOCI for "Internet") the 4th November 1994 gave as result 116 monograph titles (incl. new ed. etc.). Of course, only few of them have been inspected. (A complete list of "Internet-books on Library of Congress' information system" can be ordered from the authors.)

5. Use for communication and entertainment is also important. Communication is out of the scope of this paper. What is said here about information is also valid for entertainment use.

6. User studies in a traditional environment are plentiful. Reviews are given regularly e.g. in *ARIST*. See e.g. ALLEN, B.L.: Cognitive Research in Information Science. In: Martha E. Williams, ed. *ARIST*. Vol 26. Medford, NJ., Learned Inf., Inc., 1991. p. 3-37

7. KARLSSON, M. IT - mer teknologi an information. In: *Östgöta Correspondenten*, 1 Nov., 1994. p. All. (In Swedish)

8. Walt Kelly, Pogo.

9. ELLIS, D. A Behavioural Model for Information Retrieval System Design. *Journal of Information Science*. 15, pp. 237-247, 1989. Ellis and his associates have performed several studies of researchers from different disciplines in order to find activity patterns, which might be called strategies, used to accomplish different goals.

10. SYKES, J.B. ed. *The Concise Oxford Dictionary of Current English*. 6. ed. Oxford, Clarendon, 1976.

11. Ibid.

12. BATES, M.J. The design of Browsing and Berrypicking Techniques for the Online Search Interface. *Online Review* 13, (5) pp 407-424, 1989.

13. LIBLAB offers courses on the undergraduate level on electronic media, and on information resources. All students taking these courses learn the basics of Internet use, and use the net as an information resource for term papers and projects.

14. This is what Ellis labels as Monitoring. See 10.

15. NEXOR (n.d.) URL:http://web.nexor.co.uk/mak/doc/robots/robots.html. This is one example of an Internet resource on agents.

16. *Bra Böckers lexikon*, del 14, tredje omarb. och utök. uppl., Bra Böcker, Höganäs, 1987. Definition from Swedish encyclopedia, author's translation.

17. The IETF is the protocol engineering and development arm of the Internet... open international community of network designers, operators, vendors and researchers concerned with the evolution,...open to any interested individual. See IETF (n.d) *IETF Homepage*. URL:http://www.ietf.cnri.reston.va.us/home.html

18. MAELLING, M. *Encoding and Use of Uniform Resource Characteristics*. 8 July, 1994. URL:ftp://ds.internic.net/internet-drafts/draft-ietf-uri-urc-spec-00.txt. The proposal is available as an Internet Draft, i.e. it's a working paper. At the time for the finishing (Nov. 1994) a discussion with examples of applications was available as Mealling, 1994.

19. IRTF (Internet Research Task Force) (n.d.): IRTF Research Group on Resource Discovery. URL:http://rd.cs.cdorado.edu/~schwartz/IRTF.html

20. Sender: oclc-news@oclc.org
Precedence: bulk
Subject: Grant for Catalog Internet Resources
X-Listprocessor-Version: 6.0c - ListProcessor by Anastasios Kotsikonas
X-Comment: Press Releases from OCLC, Inc.
CEO comments: Please see attached.
FOR IMMEDIATE RELEASE FOR MORE INFORMATION CALL: Erik Jul (614) 764-43, erik_jul@oclc.org, Nita Dean (614) 761-5002, nita_dean@oclc.org U.S. DEPARTMENT OF EDUCATION PROVIDES GRANT FOR CATALOG OF INTERNET RESOURCES

DUBLIN, Ohio, Sept. 16, 1994 - The U.S. Department of Education has awarded a $62,000 College Library Technology and Cooperation grant to support the OCLC project, "Building a Catalog of Internet Resources."

The project initiates a nationwide, coordinated effort among libraries and institutions of higher education to create, implement, test and evaluate a searchable database of USMARC format bibliographic records, complete with electronic location and access information, for Internet-accessible materials.

The grant funds 58 % of the $ 107,327 project; OCLC is contributing the balance of the costs. The 18-month project is funded from Oct. 1, 1994, to March 31, 1996, through the federal Higher Education Act of 1965, Title II-A.

"We are pleased to be able to build upon the earlier efforts of the OCLC office of research and to continue extending the value of the nation's libraries, library systems and catalogs to include the rapidly growing world of networked information," said Martin Dillon, director, OCLC library resources management division, who will serve as project director. "It is essential that libraries and OCLC gain experience using library catalogs, methods and practices to include Internet materials."

In a volunteer effort, libraries participating in this project, in cooperation with representatives from their host institutions, will identify, select and catalog computer files available via the Internet. OCLC will provide participants with cataloguing guidelines and help-desk support, and facilitate the creation, searching and retrieval of bibliographic records through OCLC systems. In addition to bibliographic description, records created in this effort will contain location and access information, and they will be accessible through the OCLC PRISM service and the FirstSearch WorldCat database. The collection of records also will be made available experimentally for general Internet access, and OCLC will test the technical feasibility of providing direct user access to remote materials based on encoded location and access information. At the conclusion of the project, OCLC will host a colloquium and publish results in print and electronic format. OCLC is a nonprofit computer library service and research organization whose computer network and services link more than 18,000 libraries in 61 countries and territories. (EJ/ND)

21. Visualisation of information has been discussed earlier by the LIBLAB Group. See Hjerppe (1992). Another example of the use of visualisation in the Library and Information Science area is given in McGrath (1980). We also have a lot to learn from other disciplines such as the Natural Sciences. See Wolff (1993).

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WOLFF, R.S., YAEGER, L. *Visualization of Natural Phenomena.* Santa Clara, CA/Berlin, Telos/Springer Verlag, 1993. 374 p. + CD-ROM

22. ELLIS, H: *The Dance of Life*, 1923

Information Superhighway in Singapore*

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K. T. Noerr is the Chief Executive Officer of the IME Group, which is headquartered in London. IME develops and sells the TINLIB and Information Navigator library automation software which is installed in over 2600 sites in 45 countries and 25 languages.

Prior to IME, Ms. Noerr directed a consultancy company, IE Ltd., which conducted projects in Europe, Africa, and South America. She also worked in Sweden, at Linkoping University as a guest lecturer, and as director of Scannet, a Nordic information network. Ms. Noerr holds a BA from Brown University, and an MSc in Information Science.

Abstract

Singapore recently launched the Library 2000 initiative, and its national network SingNet. This follows from its IT 2000 initiative which anticipates the country being totally networked by the year 2000. PortNet, LawNet and other specialised networks are well advanced. Part of Library 2000 is the concept of a whole series of networked libraries, some with specialised collections like the Arts. All libraries would then have access to these specialised collections. One of the first libraries to follow the initiative is the Singapore Broadcasting Corporation who are using IME's TINLIB software as the basis for network access to the national film, video and sound collections. This is the first step towards the networked national arts library. The Singapore government has expressed its concerns about the unauthorised use of the information superhighway, particularly with regard to pornography, betting and financial transactions.

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* Paper not received in time due to extraordinary circumstances

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DBV OSI II : Open Communication between Library and Information Retrieval Systems

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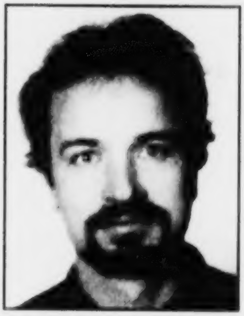
Christine Bossmeyer is Director of the Data Processing Department of 'Die Deutsche Bibliothek' in Frankfurt am Main. In this position she acts as Project Manager for DBV OSI and is responsible for development and maintenance of the German exchange format MAB. Earlier, she had been working for about 10 years at the Bochum University Library developing the first library automation system in Germany. From 1973 - 1975 she built up the network system at the Hochschulbibliothekszentrum in Cologne. In the eighties she devoted her professional work to IFLA, especially the Section on Information Technology.



Bernd Luchner got his MA degree in German Philology and History from Frankfurt University in 1986. After having worked as a journalist for 2 years, he started a training in information technology in 1988. Since 1990 he has been working in the Data Processing Department of 'Die Deutsche Bibliothek', where he was in charge for Library application development and LAN management. In 1993 he entered on the DBV-OSI II project where he is responsible for the coordination between project partners, companies and technical project manager. He is representative of 'Die Deutsche Bibliothek' in the project OPAC Network Europe (ONE).

Abstract

The paper describes the DBV-OSI II project on the background of today's library networking scenery in Germany.

DBV-OSI II is a cooperatively led and federally funded project planned to enable an open communication between library and information retrieval systems in the Federal Republic of Germany. The following goals are to be achieved:

- **to improve the availability of information and publications**
- **to create the technical infrastructure for intersystem searches and record transfer**
- **to accelerate interlibrary loan and document delivery.**

The project scope is to interconnect the participating library and information retrieval systems in a way that is transparent to the user. The search and retrieve protocols SR respectively Z39.50 were found to be suitable for this task.

A technical approach has been chosen that allows to separate between the development responsibilities of the project partners and the overall project.

To ensure the maximum range of interoperability with other SR/ Z39.50 implementations all three existing communication stacks are supported.

The new services for librarians and end-users are sketched and the further project plans are given.

1. Introduction

At the 10th International Essen Symposium (1987) C. Bossmeyer gave a paper on OSI and library systems in the Federal Republic of Germany describing problems, obstacles and chances in the development and implementation of OSI standards. During the last seven years we have made some progress and are now on the way to interlink our library systems. Furthermore we will report on DBV-OSI II, a cooperative pilot project to achieve an open communication between library and information systems. A view on the state of library networking in Germany shows how urgent the need is for an interconnection of systems.

2. Library Networking in Germany Today

In today's German library scenery there can be distinguished, in general, systems of different functionality and three levels of networking: national - regional - local.

Publications of Essen University Library, Vol. 18, pp. 180 - 193, 1995

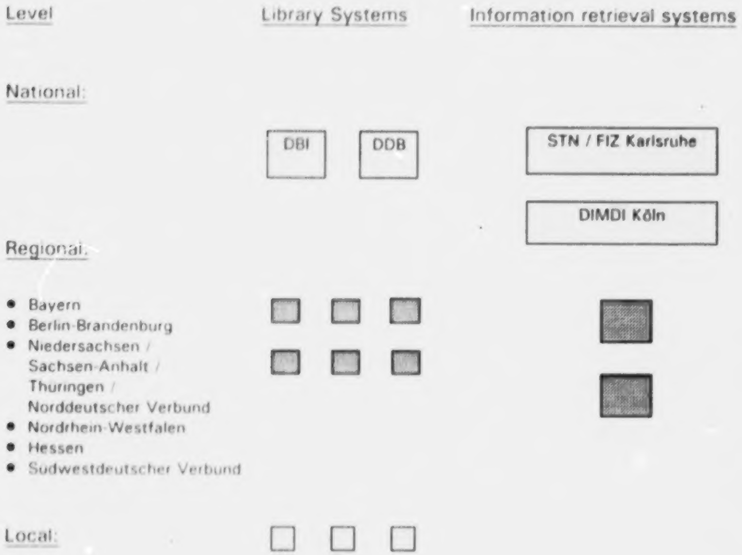

Level
Library Systems
Information retrieval systems
National:
DBI
DDB
STN / FIZ Karlsruhe
DIMDI Köln
Regional:
Bayern
Berlin-Brandenburg
Niedersachsen / Sachsen-Anhalt / Thüringen / Norddeutscher Verbund
Nordrhein-Westfalen
Hessen
Südwestdeutscher Verbund
Local:

Table 1: Scheme of different library networking levels in Germany today

2.1 Regional Level

Six regional library union utilities are the backbone of networking in Germany. University and special libraries are connected to one of these networks for cooperative online cataloging and ILL functions.

2.2 National Level

At the national level two institutions function as hosts:

The *Deutsches Bibliotheksinstitut* (DBI) runs

- the database for serials in Germany: the *Zeitschriftendatenbank* (ZDB)
- the union catalog of machine readable catalog data records: the *Verbundkatalog* (VK)
- the authority file for corporate names: the *Gemeinsame Körperschaftsdatei* (GKD)

Die Deutsche Bibliothek (DDB) is the national bibliographic agency of Germany and

- publishes the *Deutsche Nationalbibliographie*, the German national bibliography
- maintains several services for offering bibliographic records and authority data
- functions as distributor for foreign bibliographic data, e.g. the British National Bibliography.

2.3 Local Level

Different local library systems with the functionalities of OPACs and for circulation, acquisition and serial check-in exist.

2.4 Information Retrieval Systems

The *Fachinformationszentrum Karlsruhe* (FIZ) is the German STN host, providing access for example to Chemical Abstracts. The *Deutsches Institut fur Medizinische Dokumentation und Information* (DIMDI) is the German Institute for Medical Documentation and Information, which serves as host for MEDLINE and many other databases.

2.5 Improvements with DBV-OSI II

Table 1 shown above makes obvious the disadvantages of this structure:

- Information hosts and library systems are separated, e.g. end-users searching in an information database do not have any direct access to holding information.
- Regional library systems and/or regional and national library systems are isolated from each other.

DBV OSI II is planned to achieve the following goals:

- to improve the availability of information and publications
- to create the technical infrastructure for intersystem searches and record transfer
- to accelerate interlibrary loan and document delivery.

Table 2 shows which databases will be interlinked.

Table 2: With DBV-OSI II interlinked databases

Server Access to Client Accessed by	STN	DIMDI	DBI	DDB	BVB	BRZN	SWB	PICA
STN		DIMDI-Databases	ZDB		Union catalogue database	Union catalogue database	Union catalogue database	PICA-Union catalogue database
DBI	BIBLIODATA STN-Databases	DIMDI-Databases						
DIMDI	BIBLIODATA STN-Databases		ZDB					
DDB	BIBLIODATA STN-Databases	DIMDI-Databases	ZDB		Union catalogue database	Union catalogue database	Union catalogue database	PICA-Union catalogue database
BVB	BIBLIODATA STN-Databases	DIMDI-Databases	ZDB	German National Bibliography External data SWD		Union catalogue database	Union catalogue database	PICA Union catalogue database
BRZN	BIBLIODATA STN-Databases	DIMDI-Databases	ZDB	German National Bibliography External data SWD	Union catalogue database		Union catalogue database	PICA Union catalogue database
SWB	BIBLIODATA STN-Databases	DIMDI-Databases	ZDB	German National Bibliography External data SWD	Union catalogue database	Union catalogue database		PICA Union catalogue database
PICA	BIBLIODATA STN-Databases	DIMDI-Databases	ZDB	German National Bibliography	Union catalogue database	Union catalogue database	Union catalogue database	

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3. The DBV-OSI II Project

3.1 Scope of the Project

The participating partners of the DBV-OSI II project are either library systems with central functionality on the national level, regional union catalog systems or online information retrieval systems. The systems of the project partners are to be interconnected in a way that the users of a system in the client role are able to search and retrieve database records on the remote systems *using their familiar interface of their own system*. To achieve this the search and retrieve protocols SR respectively Z39.50 were identified to be suitable. These protocols enable a transparent translation of the search keys and syntax of one system to the search keys and syntax of another system.

3.2 Partners of the Project

DBV-OSI II is a cooperative project of the following partners:

- Die Deutsche Bibliothek, Frankfurt am Main (s.a.)
- Fachinformationszentrum Karlsruhe (FIZ) (s.a.)
- Deutsches Bibliotheksinstitut (DBI) (s.a.)
- Deutsches Institut für Medizinische Dokumentation und Information (DIMDI) (s.a.)
- PICA Centrum voor Bibliotheekautomatisering (Union library system of the Netherlands)
- Bayerischer Bibliotheksverbund (BVB) (Regional Union library system)
- Bibliotheksverbund Niedersachsen / Sachsen-Anhalt / Thüringen (Regional Union library system)
- Südwestdeutscher Bibliotheksverbund (SWB) (Regional Union library system)

Die Deutsche Bibliothek is responsible for project management and control.

3.3 Funding Bodies

The project is jointly funded by the following bodies:

- Federal Ministry of Research and Technology
- Federal Ministry of Education and Science
- Deutsche Forschungsgemeinschaft (DFG)

3.4 Technical Approach

During the conceptual phase, before the DBV-OSI II project was started, a technical approach was chosen to insure minimal development effort together with a maximum of re-usability of the DBV-OSI II software. Therefore a UNIX-based front-end-processor solution (FEP) was agreed upon. A well defined API would separate the development responsibilities between the overall project and the local project partner. The API would be the interface between the service-user and the service-provider modules of the SR/Z39.50 implementation. The approach allows to develop the API function libraries once for all DBV-OSI partners and it enables further use of the API outside of the DBV-OSI II project. While the service-provider software with the API-libraries is developed every DBV-OSI project partner is responsible to realize:

- the interconnection of the FEP to the host database
- the mapping of the local search keys to the attribute set
- the mapping of the local command syntax to the API-functions
- the conversion from the internal data format to the transfer record syntax and vice versa.

Table 3 shows the technical approach with the separation of development responsibilities.

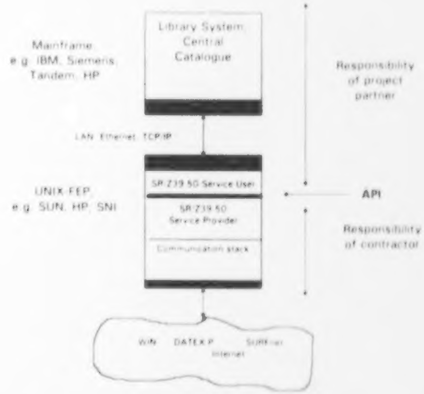

Mainframe,
e.g. IBM, Siemens,
Tandem, HP
Library System
Central
Catalogue
Responsibility
of project
partner
LAN, Ethernet, TCP/IP
UNIX-FEP,
e.g. SUN, HP, SNI
SR/Z39.50 Service User
API
SR/Z39.50
Service Provider
Communication stack
Responsibility
of contractor
WIN
DATEX-P
SURFnet
Internet

Table 3: Technical approach with the separation of development responsibilities

3.5 Realization Approach

The overall project is broken down into two implementation phases:

- Phase 1: Implementation of the SR/Z39.50-protocol
- Phase 2: Implementation of the ILL-protocol with support of Document Delivery

Phase 1 is divided into two sub-phases:

- Specification phase: July 1, 1993 until March 31, 1994
- Realization phase: October 1, 1994 until June 30, 1995

3.6 Specification Results

Within the specification sub-phase the project group had to decide about the

- support of SR/Z39.50 services
- support of data exchange formats
- support of communication stacks
- mapping of database search keys to query attributes
- design of the API
- design of an accounting mechanism between the partner systems
- definition of the new services for the users of the partner systems.

Some of these results will be explained in the following.

3.6.1 Supported SR/Z39.50 Services

The SR/Z39.50 implementation of DBV-OSI II will support the services

INITIALIZE, SEARCH, PRESENT, DELETE-RESULT-SET, SCAN, RESOURCE-REPORT, SORT, SEGMENTATION and *CLOSE*.

All services will be implemented on the basis of Z39.50 Version 3 which is expected to be adopted as the future SR Version 2.

3.6.2 Supported Data Formats

The SR/Z39.50 implementation will support the bibliographic formats of the SR/Z39.50 standards in general and in particular the bibliographic format UNIMARC.

The German *MAB* format will be supported in addition by the union catalog systems.

The non-bibliographic formats

Simple-Unstructured-Text, *OPAC-Record* and *Summary-Record*

will also be supported.

3.6.3 Supported Communication Stacks

In the following the term "communication stack" is used to refer to the ACSE (Association Control Service Element) and the layers *below* the application layer where the SR/Z30.50 protocol encoding and decoding takes place.

Direct communication between implementations which employ different communication stacks is basically not possible. Both, the SR and the Z39.50 protocol definition require the use of the ACSE services for association handling and the use of the presentation service P-DATA for the transfer of the SR/Z39.50-specific data, i.e. the OSI-stack. In practice, however, there are three different communication stacks in operation:

- the OSI-stack
- the OSI-stack with RFC 1006 on TCP/IP
- just TCP/IP.

The latter is the variant which American and Canadian Z39.50 implementations exclusively make use of.

A European library or information retrieval system which intends to provide its users not only with access to European but also to American and Canadian systems has either to support each of the three communication stacks or has to rely on the (future) existence of respective gateways.

The DBV-OSI II project partners decided that the SR/Z39.50 implementation should support all three stack variants.

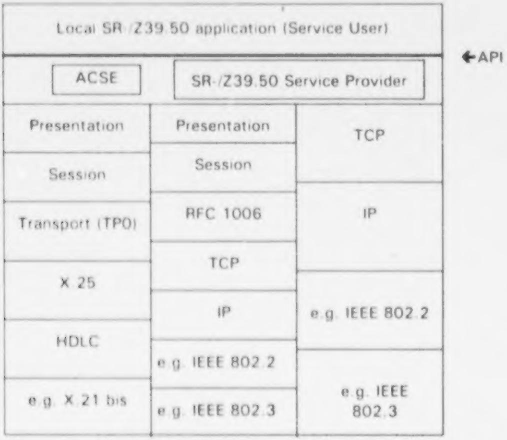

Local SR-/Z39.50 application (Service User)
API
ACSE
SR-/Z39.50 Service Provider
Presentation
Session
Transport (TP0)
X.25
HDLC
e.g. X.21 bis
Presentation
Session
RFC 1006
TCP
IP
e.g. IEEE 802.2
e.g. IEEE 802.3
TCP
IP
e.g. IEEE 802.2
e.g. IEEE 802.3

Table 4: Scheme of the DBV-OSI II application with different communication stacks to switch between

3.6.4 Database Mappings

The project partners had to map their database search keys to the"Use-attributes" of the attributeset "bib-1" of the Z39.50 standard. It turned out that none of the databases supports all of the bib-1 attributes defined by the standard but that on the other hand the databases provide search keys which are not covered by bib-1. Therefore, additional attributes had to be defined in order to improve the search possibilities for the users. With respect to these attributes, an enhancement of "bib-1" or the registration of an additional attribute set is intended. For now the extended attribute set of DBV-OSI II has been presented to CNIDR, the maintenance agency of the STAS (Scientific and Technical Attribute Set), for inclusion.

3.6.5 API Definition

The API was defined as a set of C-library functions. The C-data structures which have to be provided as function parameters are related to the APDUs (Application Protocol Data Units) of the Z39.50 protocol but are defined to be independent from any specific ASN.1 compiler. The API functions are also independent from the underlying communication stack. A table within the service provider application drives the choice of the stack for a specific connection with a target. Thus, for the service user application it is transparent which communication stack is used and there is only one set of tool-independent API functions.

3.6.6 New Services for Users

The users who will benefit of the DBV-OSI II project will be all the users of the libraries in a participating regional library union system and the users of the information retrieval systems as well. These users fall into different categories: librarians, information specialists, and the 'normal' end-users.

1. Librarians:
   They will be supported in online cataloging, in information supplying to end-users, and also in document ordering by the enhanced search and retrieve facilities across a variety of systems and levels the project provides without having to change between the systems and user interfaces.
2. Information specialists:
   They will be supported in information providing especially by the link between information retrieval systems and library systems. This link provides the holding information that corresponds to the retrieved serials without changing the system. They may access the DBV-OSI II systems through their information retrieval host or by any public available Z39.50 client.
3. End-users:
   Users of a library or of an information retrieval host connected to a DBV-OSI II system will extend their search possibilities onto the databases of the remote systems using their familiar interface of the local OPAC or of the online database provider. They may also accelerate the document delivery and interlibrary book ordering by having retrieved the correct holding information of the item.

4. Conclusion and Prospects

The project currently (December 1994) has entered into the realization sub-phase of phase 1. The development of the SR/Z39.50 application has started in October 1994. The acceptance of the implementation is scheduled to the end of May 1995.

The interoperability tests will last until the end of 1995. For the first half of the year 1996 a period of beta-tests is planned.

In phase 2 it is planned to implement the ILL protocol with support of document delivery in a selected group of local libraries and in the DBV-OSI II partner systems as well. The realization concept of phase 2 will be developed in 1995. In addition to ILL the state of the art in document delivery will be evaluated for integration in phase 2.

Appendix I: DBV-OSI II application profile

1. Communication Stacks:
OSI on X.25
OSI/RFC 1006 on TCP/IP,
directly on TCP/IP

2. Application protocols: SR and Z39.50 V3

3. Services Supported:

- INITIALIZE
- SEARCH
- PRESENT
- DELETE-RESULT-SET
- RESOURCE-REPORT
- SCAN
- SORT
- SEGMENTATION
- Extended Services (UPDATE)
- CLOSE

4. Query Syntax, Attribute-/Diagnostic-Set:

Query Syntax: RPN
Attribute-Set "attributeSet bib-1" + Extensions
Diagnostic-Set "diagnosticSet bib-1".

5. Record Syntaxes:

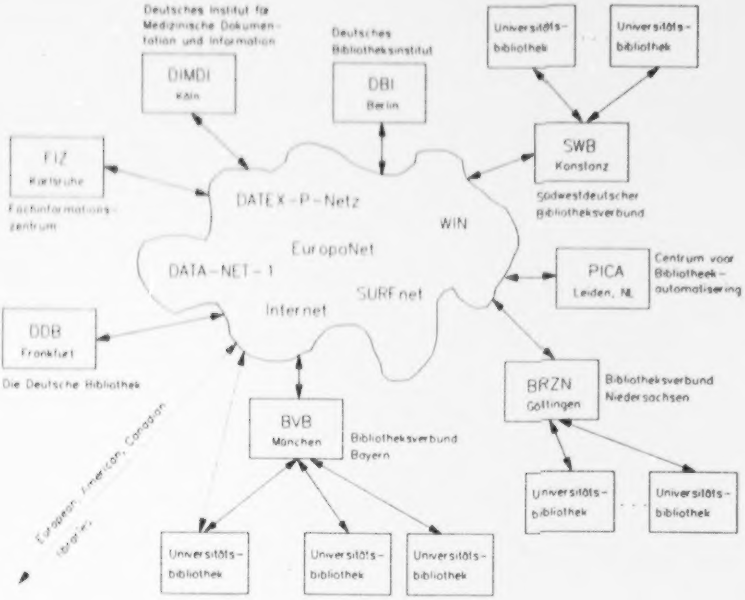
- UNIMARC
- MAB
- Summary Record
- OPAC Record
- SUTRS

6. Character Set for Search Term: ASCII (ISO 646/5426).

7. User Authentication and Resource Report Format:

User Authentication: idAuthentication type idPass
Resource Report Format: Z39.50 V3 Resource-2 (RSC.2)

Appendix II: Scheme of the DBV-OSI II network


Deutsches Institut für Medizinische Dokumentation und Information
DIMDI
Köln
Deutsches Bibliotheksinstitut
DBI
Berlin
Universitätsbibliothek
Universitätsbibliothek
SWB
Konstanz
Südwestdeutscher Bibliotheksverbund
FIZ
Karlsruhe
Fachinformationszentrum
DATEX-P-Netz
WIN
EuropaNet
DATA-NET-1
SURFnet
Internet
PICA
Leiden, NL
Centrum voor Bibliotheek-automatisering
DDB
Frankfurt
Die Deutsche Bibliothek
BRZN
Göttingen
Bibliotheksverbund Niedersachsen
European, American, Canadian libraries
BVB
München
Bibliotheksverbund Bayern
Universitätsbibliothek
Universitätsbibliothek
Universitätsbibliothek
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Organizing Fileservers on the Internet : Role of the Library

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Abstract

As the volume of information continues to grow on the Internet, organizing and structuring data on fileservers becomes more and more important. With the growth of Mosaic as a publishing tool on the Internet hypertext files proliferate on the servers. Documents are becoming dynamic, modular, multi-media, interrelated objects.

The Internet developers tackle the information explosion in a technical fashion. Internet Research Task Force efforts focus on scalable resource discovery and indexing tools, self-instrumented servers and caching mechanisms. As documents evolve from being principally human-readable to contain machine-oriented code for automatic processing, managing the new documents tends to become part of the system software and the user interface. The large and diverse user base requires in turn that user interfaces be highly customisable.

While tools deal with growth and extensibility of the Internet environment, human-guided activities deal essentially with the quality aspect of information. These activities, like resource selection, description and classification are based on topic specialization. Librarians and information specialists therefore have an important part to play.

Introduction

To question the usefulness of Internet involvement by libraries is passé. Librarians are now trying to come to grips with the new resource discovery tools and information management on the network. The theme of this symposium attests the increasing role Internet plays in library service. In discussing strategies to integrate the Internet in library service, I propose to introduce a new player on the scene: the Internet engineering community, the people who are planning, scheming and shaping the Internet.

I believe it important to have insight in their strategy and vision of an integrated information service architecture.

This insight will help us to define our role, to position ourselves in the architecture, to interact with it and thus become a player and help shape the information highway.

The Players

For the purpose of this paper I distinguish 2 main groups of players in the Internet setting:

- The first group of players is the network engineering community. This is the Internet Engineering Task Force (IETF) and the Internet Research Task Force (IRTF). The IETF working groups generate options for Internet standards and the IRTF is responsible for long-term developments. Concerning the interest area of information services, the IIIR Working Group of the IETF and the Research Group on Resource Discovery and Directory Service of the IRTF are currently the most influential players.

  This community is basically committed to the improvement of the network systems architecture and seeks technological solutions. The problems of information growth and scalability problems have their special attention.

- The second group of players is the community of information specialists. This community is much older than the Internet and has mainly been shaped by the printed media market. This is basically the publishing industry, the booktrade and the library service. With the growth of the online market, new players have appeared, like database producers and host services. This group has now entered the Internet arena and the players are moving at a different pace. Currently the library community has been most manifest and holds the spotlight.

  This community is basically committed to the improvement of the information management processes and the information organization infrastructure. Usually, information specialists seek human-guided solutions and focus on the information process instead of the underlying tools.

Let us move on the stage and take a closer look at the scenario. How does the information landscape on the Internet look like?

The Scenario

Internet engineers are already working out a scenario. They call it, "Resource discovery on the Internet".

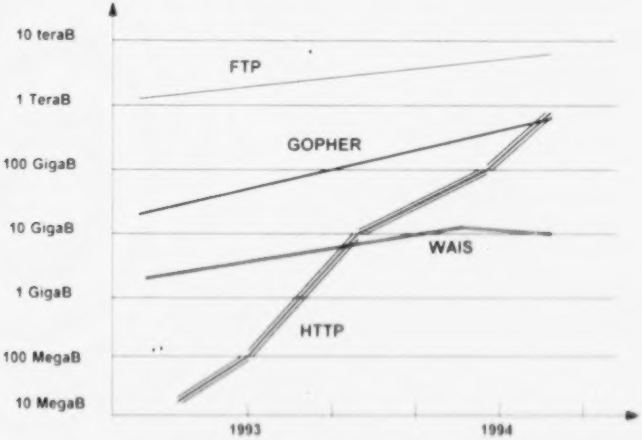

Figure 1: Usage of different information spaces on the Internet

In the past few years, a number of resource discovery tools have been developed. Because of the wide popular use of these tools, there are now a number of large but autonomous information spaces on the Internet.

There is a vast set of FTPable files, a WAIS network, a Gopher-space and a web of pointers to resources. The resources sit on different servers with different access protocols.

To resolve this separation of information spaces by protocols engineers build gateways and navigators that support multiple protocols. For the long term Internet engineers are also working on a scheme for universal resource identification[1] and a vision of an integrated Internet information service. This vision has been outlined by Chris Weider and Peter Deutsch, two active members of the IETF IIIR working group[2].

The basic architecture outlined in their paper splits up into 4 levels (**Figure 2**).

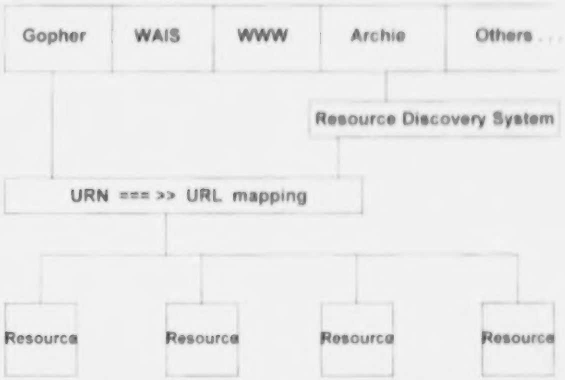

Figure 2: Architecture of an integrated information service (Vision: Weider, Deutsch)

Infrastructure for Internet Resources

1. Resource layer

At the lowest level there are the resources. These are such things as files, Gopher directories, web-pages and online library catalogs. Each resource should have a Uniform Resource Name (URN) associated with it to uniquely identify its contents. This URN is provided by the publishing agent or 'a big organization that provides URNs'.

2. URN -> URL mapping layer

At the next level there is a 'directory service' that takes a URN and returns Uniform Resource Locators (URLs) for that resource. The URL is a string which contains location information. It can be used by a navigator client to access the resource pointed to by the URL. A given resource may be replicated many times across the net and thus have a number of URLs.

3 Resource discovery layer

The third level is a 'resource discovery system'. This is a large, distributed search system. It accepts search criteria and returns URNs and associated information like version number, date, title, etc. and a set of URLs for every resource which matches the criteria.

4. Information delivery layer

The fourth level contains the various information delivery tools. These tools collate pointers to resources, provide some contextual information about the resource and eventually retrieve the resource.

This architecture aims to provide interoperability between services and is based on the interchange of resource data, names and pointers, between systems with different underlying protocols.

At a closer look, this architecture is very similar to the already existing distribution infrastructure for printed matter.

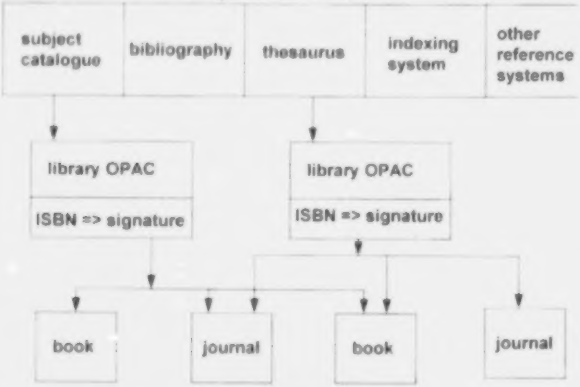
subject catalogue
bibliography
thesaurus
indexing system
other reference systems
library OPAC
ISBN => signature
library OPAC
ISBN => signature
book
journal
book
journal

Figure 3: Retrieval and distribution infrastructure for books and journals

Infrastructure for Printed Matter

1. Publication layer

At the lowest level we have books and journals with unique ISBNs and ISSNs.

2 and 3. Search, location and delivery layer

At the levels 2 and 3 we have the set of library catalogs, union catalogs and interlibrary loan systems, enabling searching, identification, location and delivery of books and journals.

4. Discovery layer

At level 4 we have the heuristic tools: the different library classification systems, the bibliographies and indexing schemes - all with different underlying organization principles.

In a way it is very convenient to find so many similarities between the traditional and the new architecture, because this will make it easier to define the role of the different players in the Internet environment.

The Role of the Network Engineering Community

In a constant effort to integrate information system diversity the Internet engineers will aim to support the interoperability between the different levels of the Weider & Deutsch architecture described above.

In an article on "Scalable Internet resource discovery"[3], the authors, who comprise the IRTF Research Group on Resource Discovery and Directory Service, indicate **research problems and approaches**. (**Figure 4**)

Scalability dimension	*Conceptual layer*	*Problems*	*Research Focus*
Data volume	Information Interface	Information overload	Topic specialization Scalable content-indexing
User base	Information dispersion	Insufficient replication Manual distribution Topology	Massive replication Access measurements Object caching
Data diversity	Information gathering	Data extraction Low data quality	Operation mapping Data mapping

Figure 4: Scalable Internet

1. Information gathering

At the information gathering level research focuses on the integration of information system diversity by means of:

- data mapping (like the mapping of URN to URL, updating levels 2 and 3 with the appropriate data as resources are published and moved around on the servers, by means of notifying or harvesting systems)
- operation mapping (constructing gateways between different delivery tools by mapping the functionality of one system onto another without actually copying the data).

2. Information dispersion

At the information dispersion level there is the problem of the user base scale. The growth of users of the Internet already overburdens the information servers. Today, hosts regularly refuse connections or return the message "Too many users. Too busy now. Try again later".

Some solutions Internet engineers are working on are:

- to replicate information servers in order to provide multiple access points to the same information and to distribute connection load. The Archie and Veronica servers, for example, process over 100,000 queries per day, generated by a few thousand users world-wide. Today over 30 Archie servers replicate a continuously growing database of more than 2 million records. Because of its success and the continual rapid growth of the Internet, in time Archie will require thousands of replicas[4].
- to implement data caching on information servers in order to improve response times and decrease network load. As the quantity and size of data objects, like multi-media web-pages, grow, keeping a local copy of these objects during a given caching period, will protect the network and the source server from repeated retrieval of the same objects.

3. Information interface

At the information interface level there is the problem of data volume scale. The growth of information on the Internet is rapid and exponential. As multi-media applications begin to proliferate users create and share voluminous audio, image and video data. Internet engineers are looking at pattern-matching techniques and indexing schemes to allow image and full-text searching. Current techniques are still too slow and require too much disk space. However, research continues relentlessly and improvement is on the way.

These are just a few illustrative problems of scale Internet engineers are trying to address. It is important to realize that the basic attitude of the Internet engineers is technology-driven. When seeking, for example, to improve the performance of an information system, they will look at ways to improve the tools which support the information process: accelerate the processing power of the indexing computer or enhance a data mapping algorithm in the source code.

An information specialist by contrast would look at the information process itself and strive to improve it through adaptation and redesign. To illustrate this different approach, imagine what librarians would do to solve the searching problem with full-text or image files: they would tend to make short descriptions of the files and index those descriptions, instead of the files themselves. Only the descriptors need to be indexed and searched. Coining the right descriptors to resources then becomes a human-guided activity which should enhance the quality of the information system as a whole.

The Role of the Library Community

Basically the role of librarians is an extension of their traditional role in the network environment. The main activities remain:

- **selecting** resources: weeding, scanning announcements on the net, discussion lists, set-up abstracting and reviewing services, retrieve or acquire resources
- **organizing and classifying** resources, set-up a navigation system
- **delivering**: provide pointers to or actual copies of the resources.

These activities mainly belong to the upper levels of the Weider & Deutsch model: the resource discovery and delivery levels.

Libraries are effectively setting up FTP-, WAIS-, Gopher- and WEB-servers. In doing this they are trying to come to grips with the new environment and the new tools.

Most library servers provide:

- a gateway to their OPAC
- information about the library collections and services: local information
- some libraries have started to experiment with the collection and organization of Internet resources and some libraries have started cataloging projects for online resources[4]
- finally libraries are taking part in the scholarly publishing process. This is a new role for academic libraries. It is based on the concept of cooperative publishing by university presses, libraries and computer centers. In this concept students and scholars submit articles and papers to libraries for storage, description and accessibility on the library document server[5].

For the organization of library fileservers these functions entail new and complex procedures on the server: complex pointer administration and file management. The use of discovery and delivery tools create special problems that need to be addressed.

In the following I propose to examine some of the major problems encountered with resource discovery tools and the solutions librarians are looking for. (**Figure 5**)

Management dimension	*Conceptual layer*	*Problems*	*Solutions*
Integration	Information organization	browsing vs searching printed vs online material	Indexing navigators Navigating OPACs
Control	Information maintainance	continuous reorganizing and reformatting of the information base	Single data input Multiple data output
Reliability	Information access	inaccessible remote information	local copies mirrors of remote sites
Continuity	Information preservation	support of old & new tools access to less used information	planned migrations

Figure 5: Manageable Internet

Problem and Solution Levels

1. Information organization

The different tools offer different functionalities and for each tool you need to assess its particular features and usage and decide how to integrate the tool in the service. Navigating tools offer browsing but not searching facilities. The user follows road maps and hyperlinks, but cannot search in terms of queries and interaction with the system. Library OPACs by contrast are developed search engines and less suited for browsing. Librarians are now looking for ways to integrate existing library systems with the new tools.

2. Information maintenance

The diversity of tools means accommodating the same information base to different retrieval systems with each their own procedures and formats. To give a few examples: files need to be reformatted in plain-ASCII text for presentation in Gopher and in HTML for presentation in the web. Pointers to resources in Gopher look different from pointers in the web. In practice then, supporting different discovery tools simultaneously means replicating and reorganizing the information base for each tool. Every change in the information base needs to be effectuated separately for each tool.

A solution to the pointer administration problem is to set up a database system with resource descriptions containing fields like title, date, subject and URL. The database can then generate appropriate outputs for the different retrieval environments: for example, produce Gopher link files and web HTML files. In this way data is only entered once and output can be manipulated easily to accommodate the different Internet protocols.

3. Information access

As mentioned above servers tend to be inaccessible when too many users make use of them. Besides server replication and data caching, another solution would be for libraries to keep a local copy of the resources they want to make available. This could be based on frequency of usage and on accessibility of the parent host. In a way networked information may still fit in the traditional library paradigm of collection based service delivery.

The management and regular updating of local copies on the server will need special attention.

4. *Information preservation*

The information system will have a tendency to lose access to unreferenced information. As information is increasingly less used, it will be migrated to storage technologies less and less suited to rapid access. Libraries will have to focus research on planned migrations to different access platforms.

Organizing the Library Server

In the following I propose a model for organizing your library fileserver on the Internet (**Figure 6**).

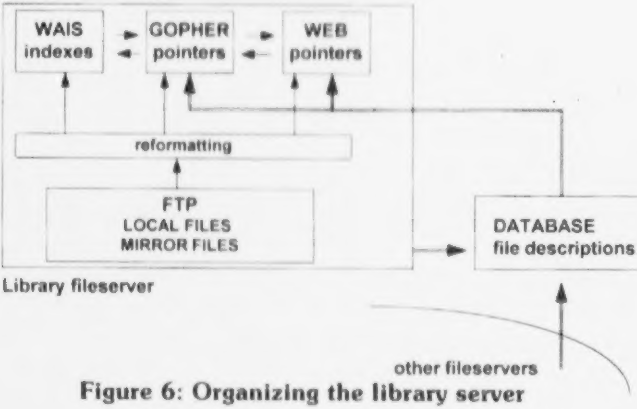
WAIS indexes
GOPHER pointers
WEB pointers
reformatting
FTP
LOCAL FILES
MIRROR FILES
DATABASE file descriptions
Library fileserver
other fileservers

Figure 6: Organizing the library server

1. *Storage level*

At the lowest level you have the repository of files, with local resources and copies of remote resources. This could be an FTP-archive.

2. *Retrieval level*

At the top level you have the retrieval or discovery tools: the different browsing and searching systems (WAIS, Gopher, web...).

3. *Reformatting level*

In between level 1 and 2 you need a reformatting level, to accommodate files for presentation under Gopher, WAIS and/or the web. At this level you will want a set of automated procedures.

4. Description level

The database of resource descriptions is not necessarily on the fileserver. It may be a local database system, or a shared library system or even the distributed Internet resource discovery system of the Weider & Deutsch model. Descriptions of files on the local server and on remote servers are entered in this database. Pointer formats for use in the different retrieval systems are outputted.

Conclusion

It is clear that librarians and Internet engineers have a common goal on the information highway: to realize a scalable and a manageable Internet. Both communities, however, speak different jargons and take different approaches. There is too little mingling of communities at conferences and symposia. At this stage it is therefore important, I feel, to stress the importance of close interaction between librarians and Internet engineers. We have been talking a lot about cooperation and strategic alliances. I think librarians should be much more active and participate in IETF-working groups that deal with information discovery services on the Internet.

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Networked Electronic Publishing of the Results of Scholarly Research

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Abstract

A review of developments in electronic publishing over the last twenty-five years is followed by a report on a survey conducted, with directors of university libraries and other academic administrators, to determine attitudes toward a networked electronic approach to the publishing of research articles. A major conclusion is that academic administrators do not now consider the academic community well equipped to undertake an enterprise of this kind and would not give it high priority in the allocation of university resources.

Introduction

The scope of the term "electronic publishing" can be interpreted in many different ways. For example, it could be considered to include all forms of electronic aids to authors, from simple word processing capabilities to actual typesetting and/or mark-up tools (Pilachowski[1]), as well as networking support to collaborative authorship and electronic communication among authors, editors, referees and other participants in the publishing process.

Since "publishing" implies production and distribution, however, the term refers most obviously to the generation of publications in electronic form or, at least, with the aid of electronics. In this more restricted sense, electronic publishing can be considered to have evolved gradually over a period of about thirty years, the evolution having the following manifestations:

1. Use of computers to generate conventional print-on-paper publications. This development can be traced back to the early 1960s (e.g., the production of Index Medicus at the National Library of Medicine). The use of electronics to print on paper is not a completely pedestrian

Publications of Essen University Library, Vol. 18, pp. 207 - 225, 1995

application since it allows new capabilities such as printing on demand and even the production of customized publications tailored to individual needs.

2. The distribution of text in electronic form, where the electronic version is the exact equivalent of a paper version and may have been used to generate the paper version.

   For secondary publications (indexing and abstracting services), this began early in the 1960s. For primary journals the development occurred somewhat later. Today there is considerable activity and interest in projects that make electronically accessible the text and/or graphics of journals that are also sold in print-on-paper form. Major projects of this kind (in which the electronic version is accessible online, as CD-ROM, or as a combination of these modes) include ADONIS (Stern and Compier[2]), Red Sage (Borman[3]), CORE (Annual Review[4], Borman[3]), and TULIP (Borman[3]). Moreover, the full text of a significant number of journals is now made accessible online by such vendors as Dialog.

3. Distribution in electronic form only but with the publication little more than a print-on-paper publication displayed electronically. Nevertheless, it may have various "value added" features, including search, data manipulation and alerting (through profile matching) capabilities.

4. The generation of completely new publications that exploit the true capabilities of electronics (e.g., hypertext and hypermedia, electronic analog models, motion, sound). This phase of development can actually be subdivided into:

   a) the presentation of existing text and graphics in innovative ways (e.g., the Perseus Project (Mylonas[5])), and

   b) the production of publications designed *ab initio* to exploit the full electronic capabilities.

While these can be considered as logical steps in an evolutionary process, the actual evolution is not easy to depict since all of the steps now co-exist (i.e., the fourth phase of the evolution is already in place but the first phase has not disappeared). Moreover, the ultimate stage, 4(b), is not yet fully realized: while some authors have produced works that were intended from conception as electronic publications (e.g., for the hypertext medium), this is by no means the norm. Some idea of the true potential of electronics in publishing can be obtained by reading in the area of "virtual reality" (e.g., Rheingold[6]; Helsel and Roth[7]; Pimental and Teixeira[8]). Krueger[9], in particular, has suggested how electronics allows completely new approaches to the presentation of information, imagination and inspiration.

Libraries have already been profoundly influenced by the developments in electronic publishing. At the lowest level of effect, it is now commonplace for them to make electronic publications available, through online access or in CD-ROM form, and to instruct patrons in the use of these resources. Several of the larger academic libraries have gone much further by establishing departments designed to support access to publications in electronic form and to exploit their capabilities. Some of these do more than the training of users and the provision of access. For example, the Electronic Text Center at the University of Virginia Library has assumed responsibility for the SGML-tagging of certain texts that lack such encoding (Seaman[10]). Libraries now being established may be designed from the beginning as "electronic libraries." For example, the Electronic Library at De Montfort University at Milton Keynes (Leicestershire, England) has entered into its own negotiations with publishers to acquire text in electronic form (Arnold et al.[11], Collier et al.[12]).

The Electronic Journal

The term "electronic journal" is almost as ambiguous as the term "electronic publishing." A very loose definition of the term - any journal existing in an electronic format - would embrace all periodicals available electronically as well as in paper copy, including the text of periodicals accessible through online networks and those periodicals distributed in CD-ROM form.

By a more strict definition, however, an electronic journal is one created for the electronic medium and available only in this medium. If we accept a rather relaxed definition of "journal," electronic journals have existed for about twenty years - the informal newsletters produced within computer conferencing networks or even the messages of the conference itself could be loosely considered as a form of journal.

Sondak and Schwarz[13] may have been first to conceive of a scholarly journal published in electronic form. However, they visualized the distribution of the journal to libraries as a computer-readable "archival file," rather than online access, and distribution to individual subscribers in the form of computer-output-microfiche. Senders et al.[14], Senders,[15,16] Roistacher[17] and Lancaster[18] were among the first to discuss possible characteristics of an online "virtual" journal, and Senders et al.[14] presented a detailed economic analysis. Roistacher[17] and Folk[19] also included some cost data.

The first experiment with a true scholarly* journal - one with editorial standards and refereeing procedures - was conducted with a journal on mental workload within the Electronic Information Exchange System, beginning in 1979 (Turoff and Hiltz[20]). Shortly afterwards, in 1980, the British Library awarded a grant to Loughborough University to establish an experimental online journal in the area of computer human factors (Shackel[21]). These early prototypes were not completely successful in that the journals thus established were not continued beyond the period of the experiments. Three major problems impeded the permanent establishment of electronic journals a decade or so ago: (1) not enough members of the target community (potential authors as well as potential readers) had the necessary terminals readily available to them; (2) other technological barriers - e.g., telecommunication problems, slow response, poor quality display, lack of "friendliness" - discouraged use; and (3) probably most important, potential authors could see no obvious rewards associated with the contribution of articles to an electronic database: no honoraria, no royalties, no evidence that such publication would carry much weight in promotion, tenure or salary decisions, and no guarantee that the audience reached would be a large one.

Nevertheless, these early experiments were valuable for the very reason that they did expose the problems that would need to be solved before a scholarly journal in electronic form could be sustained.

The probability of being able to sustain a scholarly journal solely in electronic form has increased considerably in the last decade as terminals and workstations have become more widespread, as friendlier interfaces have been developed, and as research-oriented networks have fallen into place. Many different periodicals now exist within the Internet. While the majority are rather informal newsletter-type publications (Association of Research Libraries[22]), a handful of refereed or "lightly refereed" (Okerson[23]) journals are operating, and others are in planning or development stages.

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* For the purpose of this article, "scholarly" refers to a journal in which stringent criteria on acceptance of contributions are imposed by external referees or by an editor or editorial board.

Existing electronic journals that can be considered as in some sense "scholarly" include *Postmodern Culture* (Amiran and Unsworth[24]), *Psycoloquy* (Harnad[25]), the *Electronic Journal of Communication* (Harrison et al.[26]), *New Horizons in Adult Education* (Hugo and Newell[27]), the *Journal of the International Academy of Hospitality Research* (Savage[28]), the *Public Access Computer Systems Review* (Bailey[29]), and *EJournal* (Jennings[30]). In addition to these journals existing in university settings, OCLC Inc., in collaboration with the American Association for the Advancement of Science, mounted the *Online Journal of Current Clinical Trials** and is in the process of implementing further online journals in the areas of nursing and of electronics.

All of these journals are similar in that they exist only (or, at least, primarily) in electronic form, can be accessed online, and impose certain standards on the contents of the database. There are also differences among them. Some group papers into "issues," in much the same way that a paper journal does, while others merely add new papers to the database as they are accepted. Some accept graphics as well as text, while others do not. Some journals offer contents pages and abstracts, requiring users to request the full text if wanted, while others initially disseminate the full text to users. The majority are offered free** to users but at least two are available only on a subscription basis. Some of the online journals are merely "delivered" to users via some file server or e-mail system while others allow true interaction between user and journal. Of the existing electronic journals, the *Online Journal of Current Clinical Trials* appears to be the most sophisticated, offering elaborate windowing facilities, hypertext linking (including the ability to view an abstract of an item cited in an article), and graphics.

In discussing journals in electronic form it is important to make a distinction between these new journals, established within online networks, and the print-on-paper journals that have been made accessible in electronic form by publishers, either on CD-ROM or through online networks. Projects that make the text of existing journals available on CD-ROM are primarily electronic document delivery systems. The text is stored as "bit-mapped" images of the printed journal pages, achieved through optical character recognition. Bit-mapped images require rather large amounts of storage, allow terminal display that is of low quality compared with the display of computer-readable text (e.g., in ASCII format), and cannot be searched or otherwise manipulated by computer (although ancillary databases, such as indexes to and abstracts of the page images, can be). Nevertheless, the bit-mapping approach has the obvious advantage that it allows older materials to be made available in electronic form without the need for rekeying. Of course, a particular implementation can incorporate both page images (to give the reader "the feel" of the familiar journal format) and computer-readable text; this is true, for example, in the Red Sage project, which makes use of the RightPages system devised at AT&T Bell Laboratories (Story, et al.[31]; Hoffman et al.[32]), and in the CORE project (Annual Review[4]; Entlich[33]).

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* Purchased from AAAS in 1994 by Chapman & Hall.

** This is a little misleading. While free online access is allowed, other options - e.g., to receive in paper, microfiche or diskette form - will involve a cost to recipients.

When the complete text of print-on-paper journals is made accessible through online networks, the text is in ASCII format and fully searchable. Nevertheless, such journals are merely examples of print-on-paper made accessible electronically. The new journals referred to earlier were designed *ab initio* as journals in electronic form and can be given capabilities not present in the electronic manifestations of printed journals. For example, the text can be encoded with SGML tags to improve its functionality (e.g., in the implementation of such features as windowing, hypertext and the integration of text with graphics).

A scholarly journal in electronic form can potentially offer several advantages over one printed on paper, including:

1. More rapid publishing of research results through electronic submission of articles, and network communication among authors, editors and referees, and by the fact that contributions can be added to a database as accepted rather than held to form the next "issue".
2. More efficient dissemination of information through the matching of articles newly accepted into databases with the interest profiles of potential readers.
3. Innovative ways of presenting research results and other forms of data and information - analog models, motion, sound, hypertext and hypermedia linkages (including linkages between journals and other electronic resources).
4. Public peer review facilitated through the ability to link reader comments and evaluations to published articles.
5. Lower cost per successful match between article and reader.

6. Speed of publication, and ease of communication, lead to a more interactive journal in which one contribution may spawn rapid responses from other researchers.

Carried further, an electronic journal established within a network can assume a scholarly role that is more comprehensive than the role played by the typical journal in paper form. As Stephen and Harrison[34] (1993) point out, it can become the central component in an electronic center of expertise and a key element in an online intellectual community.

The fact that several scholarly journals have recently emerged within the networks may give the impression that the problems faced by the prototypes of a decade or so ago have already been solved. This is not entirely true. It is still difficult to attract contributors (Savage[28]; Jennings[30]) and even some technological problems still exist. For example, Savage[28] and Hugo and Newell[27] have reported that some of their potential subscribers or readers do not have ready access to terminals or lack institutional support for network access, and Bailey[35] points out the limitations of ASCII text files for the distribution of electronic journals and suggests that no existing software tools can do everything needed for a fully successful implementation of a scholarly journal in electronic form. Nevertheless, while Bailey identifies several problems to be solved, he sees none that is insuperable.

There is another potential obstacle that seems to have received little attention - the fact that the desires of authors and of readers may not fully coincide. The designers of electronic journals assume that most users want the ability to jump around in text (and possibly to link with other text or other publication forms) and some writers (e.g., Arnold[36]) have suggested that a major advantage of electronic publishing is that it can deal in pieces of text rather than complete packages of text and, thus, the distinction between the journal and the monograph might no longer be meaningful. On the other hand, Tenopir[37] has reported that, in her experience, authors and publishers have strong objections to readers being able to view segments of text out of its complete context because this threatens the integrity of their work and could lead to misinterpretation and misrepresentation.

Electronic journals accessible through the networks are now receiving considerable attention from academic libraries. For example, one consortium has already accumulated on a server a collection of more than 600 such journals, is developing collection development policies, is taking steps to catalog the collection, and is studying many of the problems involved in providing access to a collection of this type (e.g., problems of archiving and of the incorporation of fee-based titles).

The scholarly journals recently emerging within the electronic networks have mostly been established within academic departments at the initiative of a handful of researchers. The impetus has not come from academic administrators or the university presses. Nevertheless, it is now becoming more generally recognized that:

1. The academic community has lost control over its research output since the published results of its research are not disseminated directly by the universities but by journal publishers, many of these in the for-profit sector, and copyright is usually transferred from researcher to publisher.
2. The university community is forced to buy back, from the commercial sector, its own research output at ever-escalating costs that make the university libraries a continued drain on institutional resources.
3. The existence of computer and telecommunications networks now allow us to conceive of a completely new approach to scholarly publishing, one in which the universities bypass the present journal publishers and publish the results of their own research in electronic form.

Some examples of this rumbling of discontent and the attendant call for significant change include the following:

> ... the continuing trend toward cancellation of journal subscriptions indicates that the costs of the practice of paying scholars to produce knowledge and then paying a second time to acquire it from publishers needs reevaluation (Britten[18]).

> ... a vision of university-based electronic networked publishing is expressed by many librarians and other members of the university community in conversations about academe's regaining control and distribution of its own intellectual output (Okerson[23]).

> Unthinkable as it might have seemed until very recently, the idea of the academy retaking control of the bulk of scholarly publishing is being forced into consideration by the practices of the commercial publishers themselves. Their bills simply cannot be paid indefinitely.

> and something must give ... The responsibility for the creation of an alternative scholarly communications system rests with the faculty and administrators of all major universities in this country and beyond (Metz and Gherman(9)).

Of course, a networked approach to disseminating the results of academic research does not necessarily imply that each institution would publish its own research output. A more likely model is one in which each university would take on the responsibility for creating and maintaining databases in a few areas in which it is recognized to be excellent. Researchers from all over the world would submit articles to be accepted into these databases in much the same way that they now submit to the publishers of paper journals, and submissions would be subjected to rigorous refereeing.

While the academy is now the center of scholarly research and of informal scholarly communication, it is not really the center of formal scholarly communication since it does not directly control its own published output. By becoming the disseminators of their own research results, the universities would become the centers of scholarly communication in the broadest sense of the term.

Attitudes towards Feasibility and Desirability

It is noteworthy that most of the discontent with the present publishing system has been expressed by library directors, and other members of the library profession, and that the initiative behind the establishment of the new electronic journals has mostly come from academic researchers. Little has been heard from academic administrators on this issue.

A survey was performed to determine the attitudes of academic administrators, particularly those directly responsible for research, towards the feasibility and desirability of a networked electronic approach to scholarly publishing. A questionnaire was mailed, on November 17, 1993, to 309 administrators associated with rather more than 100 major research institutions in North America (universities whose libraries are members of the Association of Research Libraries). Recipients fell into two broad categories: (a) library directors and (b) administrators who were assumed to hold responsibilities in the academic research area ("provost", "vice chancellor for academic affairs", "vice chancellor for research" and similar titles). Ninety nine of the questionnaires went to library directors and 210 to other academic administrators (a few directors and administrators who had participated in a pretest of the survey instrument were omitted from the mailing).

A single follow-up was mailed to non-respondents on December 6, 1993. A deadline for receipt of returns was set at January 12, 1994. As of that date, 150 usable questionnaires had been received, an overall response rate of 48.5%. The response from library directors, 72/99, or 72.7%, was much better than that from the other administrators (78/210, or 37.1%), which tends to support the fact that the academic library community sees this as a more pressing issue than does the academic administration at large. While the response rate for academic administrators was disappointing, it was not completely unexpected: the extremely busy individuals addressed tend to be the target of many surveys. Moreover, the survey was performed around the holiday season, a relatively tight deadline was established, and no aggressive follow-up (e.g., by fax or telephone) was undertaken.

The first of three questions on the survey identified ten possible advantages of the networked publishing approach and asked respondents to score each on a 5-point scale for (a) desirability and (b) probability of achievement. The results are presented in **Table 1**. The benefits judged most important are those associated with the potential for reducing the cost of disseminating the reports of research and for publishing them more rapidly. Also important are the potential benefits to the scholar trying to keep up with new developments in a field: more effective current awareness (through electronic profile matching) and the possibility of thus reducing information overload.

The questions suggested that a scholarly publishing network, freed from commercial interests, could give academia greater control over the results of its own research, might lead to more rigorous standards of acceptance in scholarly publishing, and could result in freer access to information (e.g., less copyright concern). Somewhat surprisingly, the potential for more rigorous publishing standards was not given a very high weight (some respondents pointed out that the pressure to publish would not diminish and that quantity might still be important).

From the earliest discussions on electronic journals (see, for example, Roistacher[17]), a possible advantage that has been given some emphasis is post-publication peer review. That is, readers of a scholarly article can use the network facilities to comment on it, favorably or unfavorably, and the ensuing electronic discussion could stimulate further research ideas or approaches. Respondents were not enthusiastic about this possibility.

Table 1: Possible advantages of electronic approach, and probability of achievement*

Possible advantages	Score for perceived desirability			Score for probability of achievement		
	AA	LD	T	AA	LD	T
More rapid publication	4.32	4.68	4.50	3.86	4.15	4.00
Greater control by academia	3.72	4.66	4.19	2.55	2.98	2.76
Refereeing handled more expeditiously	4.35	4.47	4.41	3.08	3.25	3.16
Open peer review	3.42	3.64	3.53	3.07	3.28	3.17
Lower cost	4.60	4.83	4.71	3.37	2.83	3.10
More effective current awareness	4.44	4.64	4.54	3.83	3.90	3.86
New ways of presenting information	4.01	4.44	4.22	3.41	4.04	3.72
Freer access to information	3.96	4.67	4.31	3.07	2.86	2.96
More rigorous publishing standards	3.54	4.13	3.83	2.19	2.51	2.35
Information overload reduced	4.06	4.97	4.51	2.72	2.18	2.45
Overall average	4.04	4.51	4.27	3.11	3.20	3.15

* The highest possible score is 5 on both desirability and probability scales. AA = academic administrators; LD = library directors; T = is the combined scores of both groups.

On the whole, the respondents were not optimistic that many of the possible advantages of networked publishing would actually be realized. Most likely to occur is the more rapid publishing of research articles. Greater control by academia, freer access to information, and more rigorous publishing standards were not seen as very likely to occur. Somewhat anomalously, networked publishing might well result in improved methods for current awareness but this was considered unlikely to reduce information overload on the individual.

The two respondent groups, library directors (LD) and academic administrators (AA), do exhibit some differences. Overall, the library directors are more positive about the potential benefits of electronic publishing but little more optimistic concerning probability of achievement. They are less optimistic that costs and information overload would be reduced. Perhaps most surprisingly, the library directors give more weight than academic administrators to the importance of greater control by academia and to the possibility of freer access to information. The library directors were more positive toward new ways of presenting information in the electronic medium and felt more strongly that this is likely to occur.

The second question identified six possible obstacles to the implementation of a scholarly publishing network and asked respondents to indicate the seriousness of these on a 5-point scale. The results are presented in **Table 2**. The greatest obstacles are those associated with the academic establishment's ability to implement, manage and support a publishing network. In general, respondents feel that the academic establishment is not well equipped to take on the task and would be unable or unwilling to support it financially. Given the ready availability of high resolution workstations, readers are considered more likely to accept network publishing than authors are, although the academic reward system is not considered an impossible barrier (i.e., respondents feel some hope that refereed electronic publishing will be acceptable in promotion and tenure

Table 2: Factors affecting implementation*

Factors	Significance as obstacle to implementation		
	AA	LD	T
Author acceptance	3.42	3.24	3.33
Reader acceptance	2.62	2.72	2.67
Academic reward	3.05	2.90	2.97
Organization and administration	3.79	3.81	3.80
Cost of implementation	3.79	3.65	3.72
Dangers	2.89	2.68	2.78

* On a 5-point scale: the higher the score, the more serious is considered the problem.
AA = academic administrators; LD = library directors; T = combined score for both groups

considerations).* The possible dangers of electronic publishing (e.g., associated with the immutability of an author's work) were not given great weight. The library directors and the academic administrators showed considerable agreement on the significance of these obstacles.

The final question (**Table 3**) identified eleven possible priorities for the assignment of university resources over the next few years and asked respondents to weight their priorities, again on a 5-point scale. Implementation of a scholarly publishing network was included to see how this would rate in comparison with the other priorities.

Table 3: Academic priorities**

Activities ranked by assigned scores		Scores		
		AA	LD	T
1	University libraries	4.12	4.50	4.31
2	Undergraduate instruction	4.20	4.37	4.28
3	Technological infrastructure	4.05	4.46	4.25
4	Faculty recruitment & retention	4.32	3.93	4.12
5	Student minority representation	3.99	4.10	4.04
6	Faculty minority representation	3.97	3.96	3.96
7	Financial aid	3.71	3.93	3.82
8	Faculty research	3.92	3.71	3.81
9	Buildings	3.29	3.52	3.40
10	Network publishing	2.97	3.76	3.36
11	Community service	3.25	3.35	3.30

** On a 5-point scale
AA = academic administrators; LD = library directors; T = combined scores for the two groups

The academic library community will be pleased to see that support of the university library appears at the top of the ranking. Not unexpectedly, it is the highest priority of the library directors; but it is also the third priority of the other academic administrators. The library directors give somewhat greater weight to the student-oriented priorities (quality of undergraduate instruction, minority representation, and financial aid) and less to those that are faculty-oriented (recruitment and retention, support of faculty research).

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* In his survey of academics in the U.S., the U.K. and Australia, Schauder found that more respondents were optimistic about the acceptance of electronic publishing than were pessimistic about it.

Among these rather major academic concerns, the subject of the survey, establishment of a scholarly publishing network, was the lowest priority for the academic administrators and close to lowest for the library directors despite the fact that "technological infrastructure" of the university is a high priority for both groups.

The survey instrument presented other opportunities for respondents to express interest in the subject of the inquiry. By supplying a telephone number at which they could be reached, respondents indicated a willingness to discuss the issues further. Twenty two of the academic administrators (i.e., 41%) and 46 of the library directors (64%) did so. Sixty four of the academic administrators (82%) and 67 of the library directors (93%) asked to receive a report of the survey results. Twenty seven of the administrators (35%) and 51 of the library directors (71%) expressed interest in attending a small invitational conference to address the subject of networked scholarly publishing.

Despite the low survey response from the academic administrators, and the fact that they gave networked publishing the lowest of priorities in the allocation of university resources, those administrators who commented on the survey were (almost without exception) strongly supportive of the idea behind scholarly electronic publishing. Some typical comments were:

> In principle, the vision described in the cover letter is exactly the way to go...I applaud this initiative (an Academic Vice President)
>
> I think this is highly desirable nationally (an Associate Provost)
>
> I think it will be transformed, with books as much as journals, and we need to prepare (a Vice President for Research)
>
> It has to occur. The current system is too slow and too expensive (a Vice President for Research)
>
> This is extremely desirable. Some of us believe it's inevitable (an Associate Vice Chancellor)

In at least one case, the survey was discussed in the Graduate Council of the university and their response was a composite of the results of this discussion. Acceptance of electronic publishing by authors and by bodies involved in promotion and tenure decisions was the problem most often mentioned by administrators, although one Associate Vice President for Research claimed that "a major stumbling block will be the Association of Research Libraries which spearheads the measure of library quality by the count of books and journals on the shelves." Other administrators pointed out that needs and acceptance will differ from one discipline to another.

Comments from library directors indicate that many feel that the library must take a leading role in such a publishing transformation. They see the library community as more receptive to this type of enterprise than much of the rest of the academic community. Progress will be slow, they feel, because of entrenched interests of faculty and the publishing industry. Perhaps the most cogent of all the comments was this one from the director of a major library on the west coast:

> You have identified the critical hurdles which must be crossed before this can happen: capital to invest in the change, display technology which readers will accept, and reluctance of authors and editors to invest their careers in a new method of publishing until the community shows that it will reward people for doing so. This last is a 'chicken and egg' dilemma. I don't know how it will be resolved, but because the system of paper journal publishing is collapsing around us even now, some resolution must occur, and when it does it will happen rapidly. It will be a tragedy, however, if the new mechanism for electronic publishing is commercially based; in that event, our costs will be no less and our control no greater. Yet that is the outcome which the major STM publishers are actively (if not intelligently) pursuing.

Based on the survey results and on the comments of the respondents, the author is left with the following impressions: (1) the whole idea is completely new to very many of the academic administrators; (2) among the administrators, there exists a small group of enthusiasts that would like to push forward with an academic publishing network; (3) library directors are more aware of the problem and more enthusiastic about the electronic alternative; (4) neither group is very optimistic that such a network will materialize in the near future; (5) administrators, in general, do not consider the academic community well equipped to take on an enterprise of this kind and would not give it a high priority in allocation of university resources.

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CAPCAS as a Route to the Digital Library

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Before joining Elsevier in 1985, he graduated from the Library and Documentation School Department Publishing & Bookselling in Amsterdam.

Abstract

In 1991 Elsevier Science (ES) made the first real step towards the production of "raw" material for the development of the digital library of the future. That step was CAPCAS (Computer Aided Production for Current Awareness Services).

CAPCAS is an (internal) database containing the complete abstracts (title, authors, keywords, abstracts, authors' addresses), of, so far, more than 400 Elsevier journal titles. At present there are some 200,000 abstracts available through CAPCAS.

In the Netherlands, the Library of the University of Tilburg (KUB) was among the first to receive a regular delivery of a selection from CAPCAS for their local storage and (electronic) dissemination via the University CWIS to their end-users.

In 1993, ES and KUB, agreed to a commercial delivery of electronic articles/files (full text/full content) of some 100 journal titles also currently being supplied to the KUB in print form. The KUB is in the process of making these articles/files also available campus-wide. With Tokyo University, ES is experimenting with FTP/IP delivery of CAPCAS generated information, enhancing the speed of distribution.

CAPCAS represents, together with other projects such as TULIP, Contents Alert and CODAS, CD-based products like the Interactive Anatomy (CD-I) and the Corrosion Atlas (Hypermedia CD-ROM), the Elsevier Science Electronic Product Strategy.

CAPCAS (Computer Aided Production for Current Awareness Services) is an electronic service resulting from a progressive journal production process which allows access to pre-publication information at a very early stage in the publishing process. In his contribution to the "Libraries and IT" report[1], D. Brown refers to CAPCAS as a significant step in the development process of electronic publishing. He clearly marks the (longer term) development from abstract projects to full text article databases.

Elsevier Science is a well respected name in science publishing. As the publisher of over 1000 STM journals, several thousand monographs, conference proceedings and online scientific information (EMBASE; GEOBASE; CABS) Elsevier Science is one of the world's largest scientific publishing houses.

Scientific information is undergoing an explosive revolution with significant changes to the way scientists in the future will need to cooperate and communicate.There is an ever increasing necessity for and supply of information. Appropriate solutions are needed to facilitate optimal availability, accessibility and retrievability. New electronic information products (or services) propose to offer innovative solutions and answers.

CAPCAS may be regarded as a stepping stone towards a digital library. A digital library that will offer end-users clearly improved functionality in terms of accessibility and retrievability. The concept of stepping stone is reflected in the way CAPCAS is available: SGML tagged ASCII; pre-published information; distributed via the fastest possible way; locally stored and disseminated via the CWIS.

In **Figure 1** this stepping stone concept is visualised.

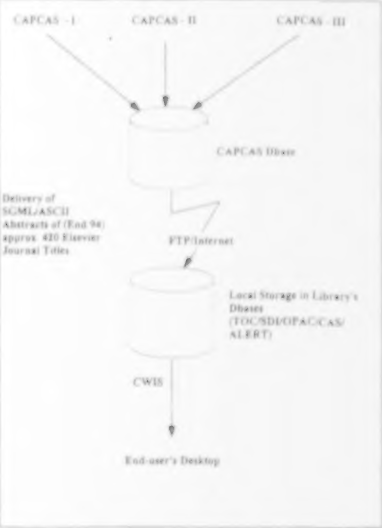
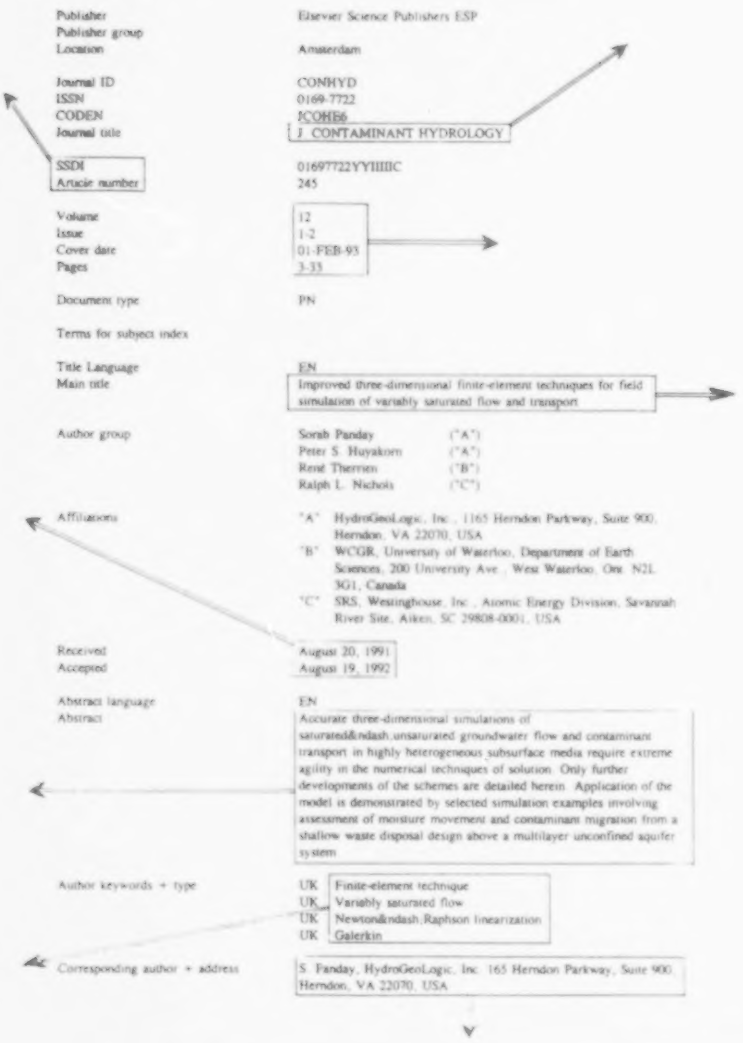

CAPCAS - I
CAPCAS - II
CAPCAS - III
CAPCAS Dbase
Delivery of SGML/ASCII Abstracts of (End 94) approx. 420 Elsevier Journal Titles
FTP/Internet
Local Storage in Library's Dbases (TOC/SDI/OPAC/CAS/ALERT)
CWIS
End-user's Desktop

Figure 1: CAPCAS Delivery to end-users

Based on the information required, library organisations may choose their own "profile" for receiving information from the CAPCAS database. This may be a selection of journal titles they subscribe to in print. At three possible stages in the pre-publication process (CAPCAS I, II and III). A SGML tagged abstract at the stage of (on average) three months before publication can be distributed via FTP/IP. This speed may enhance the accessibility of the information in a library.

The SGML will make it possible to use the information in a locally designed database environment. This will result in an improved Table-of-contents Service (TOC); an expansion of the OPAC, a newly designed SDI, or many other applications. Via the Campus Wide Information System (CWIS) the information will reach the end-user.

In **Figure 2** the various elements of an abstract can be distinguished. The construction of a database and the ability to search for information are essentially improved through the structural approach of using SGML.



Publisher	Elsevier Science Publishers ESP
Publisher group	
Location	Amsterdam
Journal ID	CONHYD
ISSN	0169-7722
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Journal title	J. CONTAMINANT HYDROLOGY
SSDI	01697722YYIIIIIC
Article number	245
Volume	12
Issue	1-2
Cover date	01-FEB-93
Pages	3-33
Document type	PN
Terms for subject index	
Title Language	EN
Main title	Improved three-dimensional finite-element techniques for field simulation of variably saturated flow and transport
Author group	Sorab Panday ("A") Peter S. Huyakorn ("A") René Therrien ("B") Ralph L. Nichols ("C")
Affiliations	"A" HydroGeoLogic, Inc., 1165 Herndon Parkway, Suite 900, Herndon, VA 22070, USA "B" WCGR, University of Waterloo, Department of Earth Sciences, 200 University Ave., West Waterloo, Ont. N2L 3G1, Canada "C" SRS, Westinghouse, Inc., Atomic Energy Division, Savannah River Site, Aiken, SC 29808-0001, USA
Received	August 20, 1991
Accepted	August 19, 1992
Abstract language	EN
Abstract	Accurate three-dimensional simulations of saturated&ndash;unsaturated groundwater flow and contaminant transport in highly heterogeneous subsurface media require extreme agility in the numerical techniques of solution. Only further developments of the schemes are detailed herein. Application of the model is demonstrated by selected simulation examples involving assessment of moisture movement and contaminant migration from a shallow waste disposal design above a multilayer unconfined aquifer system.
Author keywords + type	UK Finite-element technique UK Variably saturated flow UK Newton&ndash;Raphson linearization UK Galerkin
Corresponding author + address	S. Panday, HydroGeoLogic, Inc. 165 Herndon Parkway, Suite 900, Herndon, VA 22070, USA

Figure 2: Example of a CAPCAS Head (= Complete Abstract)

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In her paper on 3rd generation OPACs[2], G. Larsen specifically mentions directions for future development of OPAC systems. Improvements suggested are to be found in the information itself, such as record enhancement (article titles) or on the availability and accessibility of the information in a library organisation (and its affiliated libraries).

CAPCAS information may be used to do just that. The information can be mounted on to a WWW server at a library organisation for and accessible via keyword searching to their authorised user community. Additional features can be added, such as the place/location of the original journal (-paper) in the library (or departmental library). Especially larger library organisations with multiple departments may benefit from this.

Through a project offering this type of SGML structured information, as available from CAPCAS, it may be possible at various technical, organisational and operational levels to obtain a true stepping stone of understanding better the difficulties in building the library of the future.

Issues to be dealt with are as follows:

- Network/CWIS (% of organisation linked, bandwidth);
- Platform instalment (browsing, printing);
- Database organisation (Linking Reference & Primary Info);
- Cooperation of Library with Computer/Data Centres;
- Central Library versus Departmental;
- End-user education and training;
- SGML expertise/Staff training;
- User Feedback;
- Security/User Authentication.

It is thus not only the (digital) information itself that may be regarded as a (virtual) building block for the digital library. The learning curve as described above is necessary to deal with large scale projects (such as a full text/document database) in establishing the digital library. A CAPCAS project will act as an accelerator.

A good example of a library organisation that went through such a learning curve, and has now established one of the most high tech and automated libraries of Europe is the Library of the Tilburg University in the Netherlands (KUB). In his paper "Journal articles on the desktop"[3], KUB Library

Director H. Geleijnse describes their development route towards their library of the future. As one of the key projects he describes the better disclosure of journal articles. "With relatively simple procedures the accessibility of valuable and expensive information could be improved." Adding abstracts improved (and still does!) the usability of their journal holdings. In 1993 Elsevier Science and KUB agreed to follow up on the CAPCAS project with a new project that focuses on the availability of approx. 100 journals made electronically available within their campus. At the beginning of 1995, these journals were available for browsing and printing on end-users PCs and workstations.

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From Online Contents to Online Articles : Developing New Library Services at Tilburg University

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Thomas W. Place graduated in 1974 as research psychologist from the University of Amsterdam. He was a lecturer in the Department of Psychology at Tilburg University. In 1988 he came to the Library of Tilburg University as librarian for the Social Sciences. He has been project leader of several library automation projects. Currently he is deputy librarian for library systems and development.

Abstract

In 1990 Tilburg University started its Online Contents project: the scanning and OCR-ing of tables of contents of scientific journals. Since 1994 Elsevier Science supplies the full text of journal articles both as TIFF and ASCII files.

This article describes how new library services are made possible by developments like the one described above. A model of informative communication is introduced with which these new services can be put into perspective. The second part of the paper deals with the technical architecture that Tilburg University is developing necessary for the new library services.

Introduction

In 1990 the Library of Tilburg University started its Online Contents project: the scanning and OCR-ing of tables of contents of scientific journals. This project was extended to a national project with the Royal Library (Netherlands) and PICA. On this moment most of the Online Contents records are supplied by Swets via PICA.

Since 1992 Tilburg University receives from Elsevier Science the CAPCAS (Computer Aided Production of Current Awareness Service) header information of the journals that are in the collection of the library. In 1994 the cooperation with Elsevier Science got an entirely new dimension: the full text of the articles, both TIFF and ASCII files, are supplied by Elsevier Science. This project is called EASE (Elsevier Articles Supplied Electronically).

In this article I will describe how new library services are made possible by developments like the one described above. I will start with a description of a model with which these new services can be put into perspective. The second part of this paper deals with the technical architecture that we are developing necessary for the new library services.

Model of Informative Communication

Vickery and Vickery[1] represent the unit act of informative communication as an interconnection between source, channel and recipient:

$$S - M(S) - C - M(C) - I - R.$$

In this diagram source S emits a message or a text M(S) which is transferred or transmitted by channel C in the form of message M(C) to recipient R. Message M(C) is often a transformed or modified copy of the original message M(S), e.g. M(S) is a hand written manuscript which in the publication process is transformed to a printed book M(C). The effect of message M(C) on the recipient R is via the information I that is assimilated from the message by the recipient.

One way to see a library is as a store of primary information. In the approach of Vickery and Vickery[1] (p. 133) this is represented as a set of messages: ΣM. Besides storing information a library has to give access to this information. The selection of a message from a store or a collection is symbolized as $M \varepsilon \Sigma M$. (The use of the symbol ε deviates from Vickery and Vickery[1].)

To assist the patrons in selecting books from the collection a library maintains a catalogue. Like the collection of primary information the catalogue is also a store of messages or texts. The messages in the catalogue are meta-messages representing the books in the collection. Following Fairthorne[2] Vickery and Vickery[1] (p. 134) use the word 'designation' to express what in other contexts is "called index entry, bibliographic description, document representation, or surrogate in order to stress that it is designed, created by a human action to carry out a certain function". So the catalogue can be represented as a set of designations $\Sigma D(M)$ from which the patron (recipient R) can make selections: $D(M) \varepsilon \Sigma D(M)$. Which $D(M)$ and hence which M is relevant for recipient R is determined by the knowledge state $K(R)$ of R. In the knowledge state of R there is an information want that is expressed as query Q and represented by query statement $D(Q)$. Searching in the catalogue - $\Sigma D(M)$ - is finding a book description - $D(M)$ - that matches the query - $D(Q)$.

In order to represent subject retrieval in the model we must add the notion of a semantic structure $K(W)$. This is the semantic organisation of terms, subject strings and or codes. Examples of semantic structures are thesauri, classification schedules and lexicons. In a reference database $\Sigma D(M)$ the bibliographical references are indexed by the terms or codes W of an index

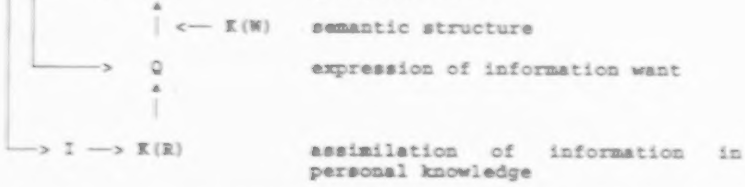
M ε ΣM
selecting a primary publication
D(M) ε ΣD(M)
selecting a reference
D(Q)
query statement
K(W)
semantic structure
Q
expression of information want
I
K(R)
assimilation of information in personal knowledge

Figure 1: Subject retrieval according to the model of informative communication (partly based on the figure on page 180 of Vickery and Vickery[1]).

language K(W). An enquirer of the reference database has to use in a subject search terms of K(W) in his query statement D(Q).

If we apply the model of informative communication to subject retrieval we get the diagram of **Figure 1**.

In **Figure 1** reference D(M) is fed back to D(Q) and Q to stress the iterative character of the search process (retrieval by reformulation[1]).

The diagram assumes that the enquirer has access to the semantic structure K(W). This can be through e.g. a printed or electronic thesaurus.

The above approach to informative communication can be extended to model recent developments in which the distinction between the source and the recipient of scientific information becomes less sharp (authors becoming their own publishers on the Internet). This is, however, a topic for another paper.

According to the model of informative communication a user of a library who is searching for information needs to have access to three different systems: semantic structures (S), reference databases (R) and, of course, collections of primary information or documents (C).

For the electronic access of a library the following systems or subsystems are relevant:

C. Collections — ΣM
  a. the book and journal collections of the classical library
  b. electronic collections
    image files of full text journal articles (eg. EASE), electronic journals, CD-ROMs with legal information

R. Reference databases — ΣD(M)

catalogue, bibliographical databases, metadatabases

S. Semantic structures — K(W)

knowledge bases / semantic networks, thesauri, topic trees, synonym lists, hierarchical menus, maps

U. User Interfaces

Z39.50 origin clients, hierarchy browsers, WWW browsers, image/PostScript/... viewers

The relations between the different system types is spelled out in the model of informative communication with the exception of the user interface. The user has electronic access to the collections, reference databases and the semantic structures through one or more user interfaces.

We want to stress that the semantic structures should be incorporated in systems which operate relatively independent from the collections and the references databases (see the proposal of Bates[4] for a front end system mind containing a vast entry vocabulary of an end user thesaurus and the study of Kristensen[5] about searching with a search-aid thesaurus).

Towards a New Architecture

The users of the Tilburg University Library can use several reference databases to access the collections of the library. **Table 1** lists the most important databases that are maintained by the library itself.

Database	Collection
Attent	Discussion Papers, research reports, Research Memoranda, "preprints"; 200 series mainly in the field of economics; subset also as PostScript files
Brabant	Literature on the province of North-Brabant
Catalogue	Book collection
Excerpta Informatica	Literature on applied computer science; mainly journal articles
Metadatabase (BAS)	Information resources; inside and outside university
Online Contents	Journal articles; subset also as image and ASCII files of Elsevier journals
Software Reviews	Reviews of pc-software
Theses	Master theses of Tilburg University
THA	Pictures of the topographical historical atlas of the province of North-Brabant; all pictures (13.000) also available as images on Photo-CD and as JPEG files in Unix file system

Table 1: The reference databases and their corresponding collections of Tilburg University Library

As you can see some of the collections are in digital form: research reports in the form of PostScript files, articles from Elsevier journals in the form of image (TIFF) and ASCII files and historical and topographical pictures in the form of JPEG files.

These new forms of collections ask for a new architecture of the library systems. To give an idea of the needed changes I will compare the present (1994) state of library automation at Tilburg University with the architecture we intend to implement in 1995.

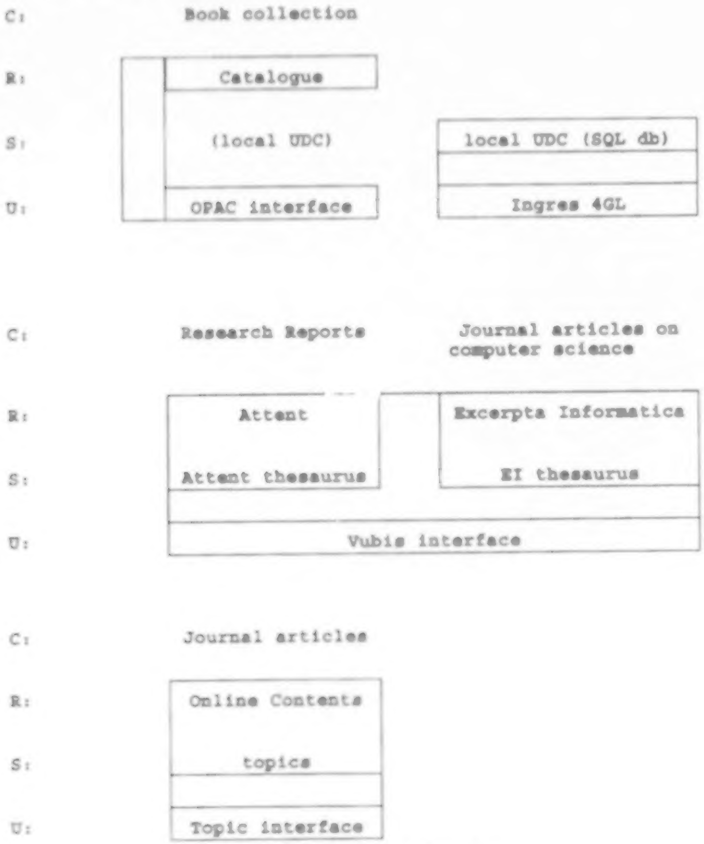
C:
Book collection
R:
Catalogue
S:
(local UDC)
local UDC (SQL db)
U:
OPAC interface
Ingres 4GL
C:
Research Reports
Journal articles on computer science
R:
Attent
Excerpta Informatica
S:
Attent thesaurus
EI thesaurus
U:
Vubis interface
C:
Journal articles
R:
Online Contents
S:
topics
U:
Topic interface

Figure 2: Present situation

Figure 2 shows some of the production systems as we run them since a couple of years. Four different database systems are used, each with its own terminal interface. The database systems are 1. the Local Library System of PICA, 2. the Vubis Library System, 3. the full text retrieval system Topic of Verity, and 4. the RDBMS Ingres. These systems are running on VAX/VMS machines. The end user can access the different systems via the KUBguide, which is a menu driven, bilingual (Dutch and English) terminal interface running on one of the VAX machines (Internet address: kublib.kub.nl) and giving access to 15 local library databases and to other services offered by computers inside and outside the university. In this way KUBguide connects to a world of heterogeneous reference databases with heterogeneous user interfaces.

Figure 2 is organised according to the four layers introduced earlier: collections (C), reference databases (R), semantic structures (S), and user interfaces (U). On the level of the user interfaces the four database systems can be recognized.

All databases have in common that the collections (C) are outside the system. The collections cannot be accessed via the user interfaces of the different systems, because the collections are not in an electronic form.

The reference databases (R), the semantic structures (S) and the user interfaces (U) are integrated parts of the systems. An exception is the catalogue which offers subject searching, but the semantic structure, in this case a local version of the UDC, is stored in a separate SQL database. There is a natural language user interface to the UDC codes written in Ingres 4GL. This interface is not integrated with the (interface to the) catalogue.

The semantic structures are bounded to their respective databases. E.g. the Excerpta Informatica thesaurus can only be used for subject searches in the Excerpta Informatica database. The topic trees developed by our documentalists can only be used for searching the Online Contents database. This is contrary to what I stated earlier that the semantic structures should be independent from the reference databases.

Figure 3 shows the new architecture that we are implementing on the moment. The most important change is the client/server architecture. In **Figure 3** this is depicted by adding a protocol layer between the user interface layer (U) and the other layers (S, R, and C). The user interface is realised as a separate client application running in the case of Tilburg University on PCs with Windows. The semantic structures, the reference

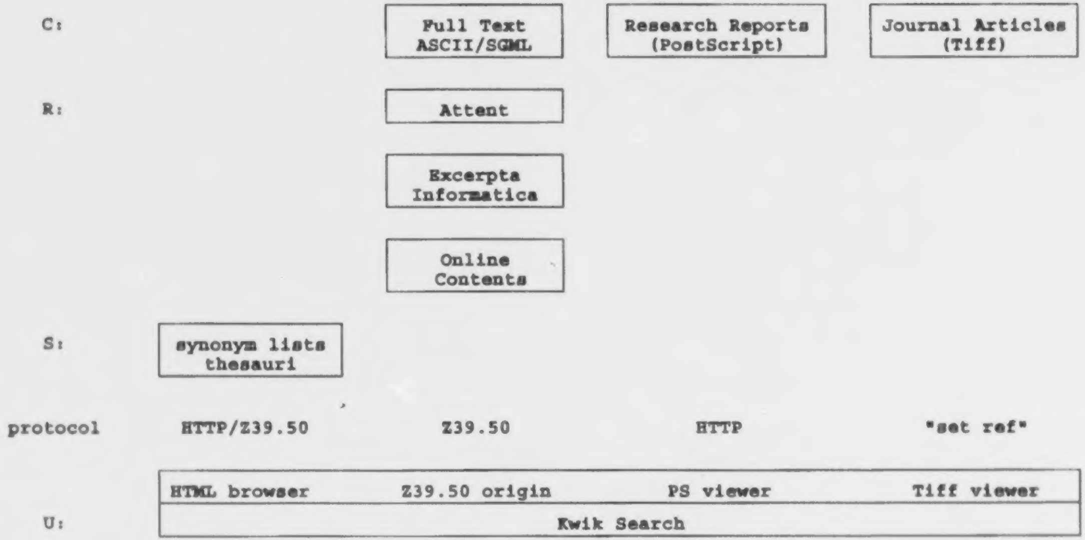
C:
Full Text ASCII/SGML
Research Reports (PostScript)
Journal Articles (Tiff)
R:
Attent
Excerpta Informatica
Online Contents
S:
synonym lists thesauri
protocol
HTTP/Z39.50
Z39.50
HTTP
"set ref"
HTML browser
Z39.50 origin
PS viewer
Tiff viewer
U:
Kwik Search

Figure 3: The new architecture: 1995 -...

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databases and the electronic collections are stored on (Unix) servers. The communication protocol is TCP/IP on top of which different application protocols can be used: e.g. the World Wide Web protocol HTTP (Hyper Text Transport Protocol), the Information Retrieval protocol Z39.50 and the File Transport Protocol (FTP).

In **Figure 2** the rows represent the four layers while the columns represent the different database systems (for layout reasons the columns are partly put below each other in **Figure 2**). In the new architecture we can abstract from the database systems. In **Figure 3** the columns represent the different application protocols. Electronic collections, reference databases and semantic structures can in principle be placed in each protocol column.

The different protocols come together in one user interface which is called Kwik Search, which is a port of Carnegie Mellon University's Mercury software ('kwik' is the Dutch translation of 'mercury'). In cooperation with Digital Equipment the Unix/Motif implementation of CMU is ported to MS-Windows. This software implements a Z39.50 origin with a graphical user interface. Kwik can also display images and other file formats. It is written with C directly on the Windows API and on the Winsock API. Because of this Kwik has a very good performance.

Kwik Search can handle different file formats. For some formats external viewers are used. This is the case for JPEG and PostScript.

For TIFF files Kwik Search has its own internal viewer. This viewer and the "set ref" protocol are especially designed to handle the TIFF CCITT Group4 images of the Elsevier journal articles. The images are scanned by Elsevier at 300 dots per inch. Each Elsevier image corresponds to a page of the printed article. For each article there is a set of images on the image server. Each set of images has a set reference. When searching the Online Contents database via Z39.50 set references are returned as part of the bibliographical descriptions of the Elsevier articles. With a set reference Kwik Search can ask the image server for images. The "set ref" protocol allows the user of the viewer to move around in a set of images: first page of an article, last page, next page, previous page, goto page n. With the "set ref" protocol the viewer informs the image server whether an image is displayed on the screen of the PC, is printed or is saved to disk. This information is important because of the licence of Elsevier Science. The "set ref" protocol has of course also provisions for user authorization.

Special attention is given to the TIFF decompression which is, without special measures, very slow. We try to solve this problem not by buying special TIFF decompression hardware for each PC (thousands on the campus) but by writing special purpose software.

Another problem is the printing of the Elsevier images: decompressing a TIFF CCITT G4 image to a bitmap and printing it as PostScript file costs with a normal printer (15 normal pages / minute) one page per minute. The solution is to use a PostScript Level 2 printer. No decompression is necessary because the TIFF file goes as such in a PostScript file. Modern PostScript Level 2 printers have dedicated processors (RISC or DSP) which do the decompression fast.

The electronic collection of Elsevier journal articles are stored on a Digital Alpha AXP under OSF/1 which is used as an image server in combination with 38 Gb RW530 Jukebox. 32 rewritable optical disks (1.2 Gb each) can be loaded in two parallel optical disk drives. For caching purposes two very fast 2.57 Gb magnetic discs are used. Digital's Hierarchical Storage Manager makes the total of 43 Gb disk space available to the programmer as a Unix filesystem. The jukebox is effectively hidden for the programmer who just opens, reads and writes files in terms of the usual Unix path names. The image server uses the aforementioned "set ref" protocol.

For search and retrieve both in the case of reference database and in the case of full text databases Z39.50 is used. On the server side we decided after extensive tests with several products to use Trip as search engine.

Semantic structures like the thesauri of Excerpta Informatica and Attent and synonym lists will be stored as separate databases. On this moment we are discussing whether to use Z39.50 and/or HTTP to access the semantic structures. The records will probably be presented to the client as HTML documents. For this reason a simple HTML browser has to be implemented in Kwik Search.

In January 1995 we will start with the introduction of the new software to our end users. This will also be the introduction of Elsevier journal articles online. The introduction will be accompanied by user studies and log file analyses.

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End-User Searching and Document Ordering : The Experience with the OCLC FirstSearch Service

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Per Halberg has a BA degree from Stockholm University and was qualified as a librarian at The Royal Library. He worked for the Library of the Swedish Academy of Music and the public library in Luleå before joining Bibliotekstjänst Ltd in 1970. Per Halberg is currently, as Division Manager, responsible for the bibliographic services at Bibliotekstjänst.

Abstract

In the past year OCLC has coordinated national evaluations of its end-user reference service FirstSearch in France, Scandinavia and Spain. The paper outlines the outcomes of these evaluations.

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Introduction

Last year, as part of my paper "Resource sharing through OCLC : a comprehensive approach" to this symposium I reported on the pilot evaluation of OCLC's FirstSearch service by 82 universities in the United Kingdom. At that time we at OCLC Europe were at the very beginning of implementing FirstSearch here in Europe. Today, I am grateful to Ahmed to allow me to continue where I left off and to update you on users' reactions to FirstSearch in a number of European countries. In fact, I'm here as one part of a European double act, as today I'm partnered by Per Halberg from Bibliotekstjänst (BTJ), who as an OCLC distributor has been responsible for the implementation of FirstSearch in the Scandinavian countries.

I have no intention, or indeed time, to describe the features of FirstSearch in detail. FirstSearch is available in the exhibition area and I invite you to try it for yourself during the symposium. FirstSearch provides a single simple interface to 48 citation and full text databases, across all subjects, the majority of which are linked to holdings in the OCLC Online Union Catalogue and a document ordering capability to third party vendors including UMI, British Library and ISI. Version 3.0 of the FirstSearch interface is scheduled for release next week (31st October) and will include Boolean "OR", more full text databases and document delivery of full text via Internet to e-mail addresses.

The growth of use of FirstSearch in the US and it's take up here in Europe in the last 12 months has been very exciting. At the end of August 1994 there were more than 2,000 institutions world-wide using FirstSearch - more than double the number in August 1993. Usage, as measured in searches has also doubled as can be seen in **Figure 1**. This graph shows very clearly the pattern of use throughout the academic year and also shows that we logged more than 1 million searches for the first time in the month of September 1994. At the present time some 60 institutions, 25 of them in Scandinavia, are subscribing to FirstSearch here in Europe.

FirstSearch is one of a new generation of products which is helping librarians make the transition to the electronic or virtual library. It is a tool for those libraries who want to change from being librarian centred and collection orientated to be user centred and access orientated. This change requires change not only within the library but also within the institution of which the library is a part and demands with it changes in management, focus and attitude.

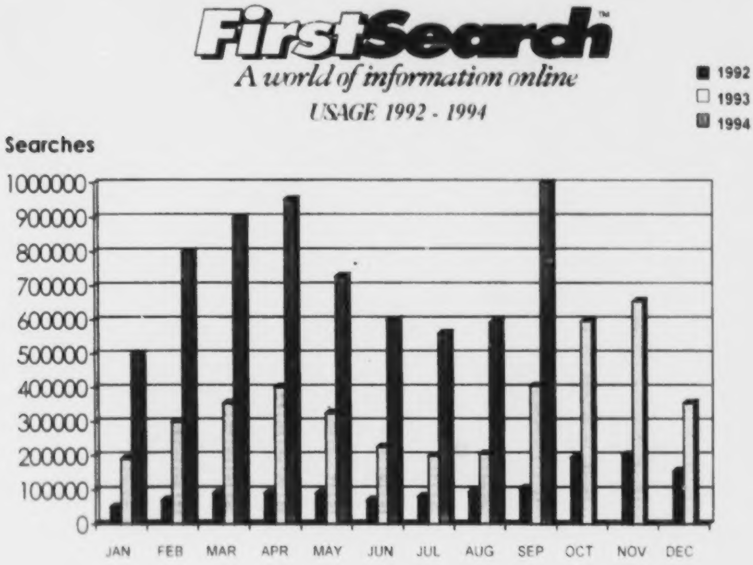

Figure 1

Not all libraries, or indeed library communities, are ready to make this transition. This is particularly true in the context of the continuum of library automation in Europe. FirstSearch is designed to be used in a networked online environment such as a campus or commercial organisation where researchers and users have the necessary facilities, experience and support to access information directly. Since for many institutions this is a new step OCLC, and our partners, have begun the implementation of FirstSearch by setting up evaluations in which libraries and library users have been able to use FirstSearch for a trial period before taking the decision of implementing it within their institution. This has enabled both librarians and users to gain a better understanding of the potential of the product, provided the opportunity to influence decision makers within institutions and provided time for administrators to consider and plan FirstSearch's implementation within their institution.

Evaluation of End-user Reference Service

To date we have completed evaluations in the United Kingdom and Ireland, France, Spain and Sweden. Evaluations are presently underway in Norway and the Netherlands and are planned to begin shortly in Denmark, Israel and South Africa.

We have taken a similar approach in each of the evaluations:

1. Every institution participating has nominated a coordinator.
2. Both librarians and end-users have been asked to participate.
3. OCLC, with permission of the database providers, has made available free access to a range of 20 FirstSearch databases - this has subsequently been increased to 44 databases.
4. OCLC Europe, or its distributor, has provided an introductory familiarisation seminar prior to the evaluation and telephone/e-mail support during the evaluation.
5. OCLC has logged the number of searches against each database for each institution.
6. A report of the evaluation has been prepared for discussion with each evaluation group.

Let me start by comparing the first 3 evaluation groups:

Evaluation 1 - France - University Libraries

OCLC Distributor: AUROC
Timeframe: March - May 1994
Participants: 6 University Libraries
Access: Internet
Total Searches: 2,839

Evaluation 2 - Spain -

OCLC Distributor: Doc6
Timeframe: January - May 1994
Participants: 2 universities, 1 research centre
Access: Internet
Total Searches: 4,855

Evaluation 3 *- France -* *non-university libraries*

OCLC Distributor:	Doc&Co
Timeframe:	January - March 1994
Participants:	9 special libraries
Access:	Transpac
Total searches:	1,370

We don't have time to do more than indicate the highlights of each evaluation under a few of the interesting topics covered by the questionnaire:

Databases Accessed

In each evaluation we logged the number of searches each institution made by database and then produced an overall picture and "database top ten" for the group.

Database top ten

AUROC	**Doc6**	**Doc&Co**
WorldCat	WorldCat	WorldCat
ArticleFirst	Medline	ArticleFirst
Medline	ArticleFirst	ContentsFirst
BIOSIS	Library Literature	Newspaper Index
ContentsFirst	ContentsFirst	ERIC
Worldscope	Engineering Index	Medline
ERIC	Humanities	Bus Per Index
Bus Per Index	ERIC	Microcomputer Abs
Education Index	Newspaper Index	ASTI
Disclosure	App Sci & Tech Ind	WorldScope

If we look at the breakdown for each evaluation the situation is very similar, not only between the evaluations but also when compared with actual usage: by far the most used database on FirstSearch is the OCLC database WorldCat, followed by ArticleFirst and then the range of subject databases. At the same time one of the most positive perceptions of the service by evaluating libraries is the range of databases that FirstSearch provides.

Telecommunications

In France, the university libraries accessing via Internet reported no problem in making the connection. Some sites, but not all, experienced degradation of response time during the afternoon. In Spain there were initially severe problems with response time. However, since the evaluation coincided with a substantial upgrading of international Internet connections from Spain in March, when the evaluation was originally scheduled to finish, we extended the timeframe and the sites reported substantially improved and satisfactory response times.

Ease of Use

In each case the majority of participants were satisfied with the results and found the interface "easy" or "very easy" to use. In cases where we were able to differentiate between librarian and end-user usage more end-users marked the interface "very easy" than librarians. The French university libraries found the screen layout too cluttered; a remark repeated by the Spanish group. The French university libraries also found the English language interface required librarians to provide assistance to end-users. This comment was not made by either the French special libraries or the Spanish group.

The Spanish group, however, found severe problems in printing out and downloading citations and in fact for most of the evaluation these sites were limited to full screen prints since there was little available technical support within the institutions which could be drawn on to assist the users in resolving this issue.

The downloading capabilities OCLC is able to offer FirstSearch users is limited by the agreements we have with the database producers. We are, however, attempting to address these concerns with the database producers, who we hope with longer term experience, will feel able to relax some of the restrictions imposed upon us.

Document Ordering

None of the libraries in this group of evaluations made much use of document ordering during the trial although some of the free range comments such as "How do you procure documents not located in France" indicate a potential interest and demand from end-users. OCLC's own figures show a gradual increase in the number of document ordering requests originating from FirstSearch users. British Library is proving to be a popular supplier receiving requests from USA, Denmark, Australia and New Zealand.

The Experience with the OCLC FirstSearch in Scandinavia

The BTJ - OCLC Co-operation

Bibliotekstjänst AB is an information company that develops and sells products, services and technology within the field of media and information. Our activities are aimed preliminary at the library sector. The Swedish Library Association is the principal shareholder. Our main office is situated in the university town of Lund in the south of Sweden. As you may see from the slide our main office is shaped like a vessel, ready for take off into cyberspace. BTJ has 350 employees and 700 MSEK in annual revenues from the sale of books in library bindings, subscription services, local library systems, bibliographic databases, etc. In 1993 our co-operation with the OCLC company was formalised. A dedicated line between Lund and Birmingham was established. Our commitments as a reseller of the OCLC services include the promotion and maintaining of FirstSearch. The marketing of FirstSearch was preceded by a period of evaluation. The planning was by the way made by the two of us during an interval in last years inspiring Essen Symposium.

45 libraries from Scandinavia took part in the evaluation. They were offered the service free for a period of two months. All databases were available. Testing were research libraries, public libraries and companies. A questionnaire was distributed. Answering it were private persons, students, scientists, library staff and employees at companies.

I will briefly summarise the results of the answers to the questionnaire.

Results from the Questionnaire

Searches

The most common type of search was "searching on a specific topic" (50%), after that "finding out what FirstSearch is" (22%). Those who chose "other" searched among other things for reviews, for articles about a certain person, to see how often an author is cited, for future conferences, for company products, etc. Also to see how much Swedish material is published in the USA, to find and order articles, to test the system and search the indexes. The least used search was "finding details about a specific book/document".

Topics

The most widely searched topic areas were "science/technology" and "arts/humanities". This can partly be explained by the homogeneity of the test group. It consisted mainly of research libraries and quite a few of them have a technical bias. The least used topic area is "business/law"; again probably because of the character of the participating libraries.

Choice of Databases

All 40 databases have been used, but to a varying degree. The five most used during February-March are in falling order: WorldCat (36%), ArticleFirst (25%), Inspec (14%), MLA Bibliography (5%) and ContentsFirst (4%). Since the evaluation continued for another month for some of the participants, these figures are not 100% certain. However, they give a rough idea of how popular the different databases are. Here, again, the answers reflect the character of the participating libraries.

System Reliability

As to the reliability of FirstSearch's functioning time, the answers were in general positive and all the participants were pleased. About 80% had no problems accessing FirstSearch during its opening hours. 20% have had smaller problems with accessibility, that is, access has been achieved only after a second try. Other problems have been: log out while searching, communications failure resulting in the message "Disconnected". Some users experienced log in problems and sometimes the system has locked itself. A lot of the problems were concentrated to one week, during which Birmingham had communication problems. The users received this message on their screens: "Modem not responding".

Accessibility

About 45% found searching "very easy", 44% found it "quite easy". What was experienced as a problem was the fact that you have to go back to the general menu to start a new search. This was sometimes felt to be tedious. Some users found the screen lay-out not clear. Too much text was seen as confusing and the size and typeface of the text too much alike. Some found it difficult to limit the search to the correct topic area. Some had problems with printing, but most users found that they learned very quickly how the system works.

Opinions on the Interface

Reactions to the interface have been both positive and negative. Some find the screen difficult to read, since the same size and typeface are used for all the text. Also, it was felt that there is too much information/text on the screen which could be put to better use by being filled with the references. Some users missed the Boolean operator "or" and thought that it should be possible to "reuse" previous searches. Some users would prefer to see the whole title when listing references. Professional database users find the system somewhat slow and over explicit and would like to see different levels in the search language. One level for advanced searching and one for less experienced searching. Even though there are some things to be desired as far as the interface is concerned, most users did find searching easy.

Information Retrieval

More than 70% of the participants found the information they wanted and were satisfied with it. Very often other references not included in the original search can be found, so frequently you get more than you ask for. Few have had no hits at all in a specific search (12%), more have "partly" found references (17%). When nothing has been found it may have been when searching for an article by a specific author or on "narrow" topics. Some of the participants miss abstracts, which cannot be found on all references. They would also like to see more full text databases.

Interest in FirstSearch

As much as 95% of the participants would like to have access to FirstSearch in their library/institution. Among other things they found the mass of information in the databases impressive. The remaining 5% who don't want the service say that the main reason is the cost. Many, above all the researchers, wish to have access to FirstSearch in their office as a complement to other systems. For certain libraries with a narrow topical direction and the need for professional search methods FirstSearch was too limited. Participants used to database searching find FirstSearch simple, over exploit and would like two search screens. One for the inexperienced end-user and one for the professional user.

Different Kinds of Test Subjects

Those who have primarily tested FirstSearch are library/institutional personnel (36%), university researchers (31%) and students (20%). Many of the libraries are research libraries and they constitute a homogeneous test group. Also some private persons have tested the system and employees at Ericsson components have delivered very useful questionnaires. The group defined as "other" is mainly made up of company employees.

Other Comments and Suggestions from the Participants

On the whole FirstSearch was well liked as a source of information, because it contains such an immense amount of references. It is also seen as an advantage that the search language is common to all databases and it was considered easy to use. However, the search system was seen as clumsy and slow with all the transactions and sometimes it's not possible to search and order older material. Some inveterate CD-ROM users found FirstSearch long winded, but did on the other hand appreciate the ordering facilities. Some thought that document delivery should be possible on more databases. Quite a few complained about the printing methods and about the lack of down-loading possibilities. This is probably due to ignorance of the routines.

Topics Raised by Users

The Future for Professional User

The fact that a retrieval package like FirstSearch, designed for the end-user, was tested by professionals gave inspiration to the discussion of the role of documentalists and librarians. It became very concrete as some of the experienced professionals showed a minor interest in involving the end-user in the evaluation. We also got a couple of remarks not worth mentioning about populism and low quality.

The Charging Policy

The possibility to sell searches in the form of coupons has been much discussed among the public libraries. Due to a well established policy the services in our public libraries should be free of charge. Earlier experiments with reference services on a broader scale have failed due to the policy of free services. Stockholm public library made FirstSearch available via their local system BTJ 2000. They intend to finance FirstSearch by selling coupons. This will mean a change of policy. The project has been delayed by bureaucracy on a high level in the town hall of Stockholm.

The Convergence of Research and Public Libraries

Within the period of evaluation a seminar was held at BTJ in Lund. The participating institutions were invited. This was in fact one of the first meetings in Sweden where professionals from both research and public libraries came together in order to discuss a common activity on a concrete and practical level. At the meeting the experience of FirstSearch was discussed in detail but by the end of the day a general discussion of the converging information policies at different types of libraries started up. The appearance of FirstSearch has, I dare say, made libraries in Sweden aware of the necessity to define the roles of different types of libraries.

The Future of Public Libraries

The demand on public libraries to adopt the new techniques already established at leading research libraries is of course well known and discussed everywhere. However, the very existence of the simple solution that FirstSearch provides has influenced thinking at libraries with little or no experience of Internet applications. "The reference services have to be changed - now!"

The Gap between the Expert and the End-user

The more intense the discussions have grown the more we have become aware of the gap between the experts, the technicians, "Mosaic Masters" and the end-user, be it library staff or patrons.

The Need for Practical Solutions

The need for simple solutions has been very much stressed this year. A selection of databases searchable in a very simple and standardised way can from the technician's point of view seem old fashioned and it is far away from the glistening graphic elegance of the newest facilities. "FirstSearch is reality," one of the testing persons said.

The Benefits of a Service Including Easy Retrieval - ILL - Document Ordering

The combination of easy retrieval, ILL facilities (WorldCat) and document ordering within the same work flow has been very much appreciated. The opportunity of receiving combined services from one single supplier/reseller will aid the libraries in dealing with this kind of work quickly, efficiently and economically.

The Sense of Co-operation

This is a topic which has been raised, among other reasons, because of the problems with costs. There is now, I think, a tendency towards common actions between libraries in order to get discounts from the suppliers by organising cooperatives and for instance ordering searches in large quantities. As an alternative to that solution which may give rise to some intricate practical problems, organisations like BTJ can take the role of wholesale dealer by buying in bulk and selling searches, etc. at favourable prices.

Conclusion

As stated by Janet Mitchell, FirstSearch is one of the new generation products which is helping librarians make the transition to the electronic or virtual library. In Scandinavia some library communities are definetly not ready to make this transition. The introduction of FirstSearch, has, I dare say, made many colleagues aware of the future problems. The reaction has been very positive, mostly. Those who are still anxious may become confident by the fact that they, helped by a practical tool like FirstSearch, will be able to respond to the growing demands of information services and full text retrieval.

ALEPH : New Approach to Library System's Architecture

Robert Simon

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Abstract

A new approach to library system's architecture is implemented in the *ALEPH* new 4.0 version. The new proposed 4-layer architecture is based on separate layers, each addressing a separate system function.

The 4 system layers are:

• **CLIENT**	**User Interface layer**
• **APPLICATION PROGRAMS**	**Functional layer**
• **IO ENGINE**	**High level database management layer**
• **DBMS**	**Database storage and maintenance layer**

The advantages of the 4-layer architecture:

- **Parallel support by *ALEPH* of GUI and character mode CLIENTS**
- **Control on performance - a scalable architecture**
- **Preserving investments in *ALEPH*:**
  - **The application layer - functionality / flexibility**
  - **The IO ENGINE layer - DBMS management**
- **Optional DBMS packages supported by *ALEPH***

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ALEPH, an integrated library system, is a flexible system based on table driven generators, that enable libraries to control and manage their local requirements accurately and efficiently. The flexibility of the *ALEPH* system was designed to serve the library functional needs, i.e. full control by the library of the following aspects:

- User interface
- Library work flow
- Record structure and indexes
- Display and print formats
- Alphabets

A new concept of architecture is now introduced into the *ALEPH* system.

The *ALEPH* version 4.0 architecture - A 4-layer approach

The new 4-layer system architecture will address the main needs of the very fast developing libraries market:

1. Being able to easily integrate new clients to *ALEPH*, based on GUI (graphical user interface), but in parallel maintain the present character mode UI (user interface). Both options are feasible in a single library environment.
2. In the case of big databases and high volume of transactions, the new version 4.0 architecture will support scalable hardware configurations. That is, being able to address performance requirements by modifying and upgrading hardware configurations in proximate linearity.
3. Maintaining the existing expertise and know-how of the *ALEPH* system accumulated in the application and IO (input/output) ENGINE layers over the years of working together with libraries.
4. Keeping an open approach in *ALEPH* version 4.0 towards the DBMS layer. This will enable interfacing with different DBMS packages.
5. Being able to easily interface with other application outside of *ALEPH* through the *ALEPH* IO ENGINE.

New *ALEPH* Architecture

The new flexible architecture of the *ALEPH* system will support the following:

- A standard DBMS package
- The client-server architecture
- Ability to support up to 10,000,000 records and 1,500 concurrent users
- A new design of a database, implemented over a network of servers and clients.

The proposed *ALEPH* library system is composed of 4 logical layers.

• CLIENT	User interface layer
• APPLICATION PROGRAMS	Functional layer
• IO ENGINE	High level database management layer
• DBMS	Database storage and maintenance layer

Each logical layer receives requests from a higher layer, manipulates them, if needed issues a consecutive request to a lower layer; and returns an answer to the higher layer.

The CLIENT - User Interface layer

The CLIENT layer requests services from the *ALEPH* application layer and receives the relevant data as a reply.

For example:

Pressing the FIND button in the CLIENT will activate the FIND service in the application layer. The reply to the CLIENT is a set of the relevant records.

At present, *ALEPH* supports two communication protocols between the CLIENT layer and the APPLICATION layer:

- World Wide Web protocol (Mosaic client)

- SR/Z39.50 protocol (Beta Site)

Both protocols support the interfacing of several clients such as Mosaic (available on MS-Windows, X-Windows and Mackintosh) and Z39.50 clients.

The services provided by the APPLICATION layer will support, in parallel to the GUI clients, the traditional VT terminal UI.

APPLICATION PROGRAMS - Functional layer

The APPLICATION program's layer in *ALEPH* supports library functionalities in an integrated way. The functionalities supported include the following modules:

- OPAC
- CATALOGING
- AUTHORITY CONTROL
- CIRCULATION
- PHOTOCOPIES CONTROL
- INTERLIBRARY LOAN
- ACQUISITIONS
- SERIALS CONTROL
- STATISTICS

The comprehensive functionality available in the *ALEPH* system is preserved in the new architecture concept. Using the available table driven generators, users are and will be able to derive their local needs, customizing the system in accordance to a changing environment. *ALEPH*'s academic background guarantees the continual development of advanced functionalities that will support the growing needs in this area.

IO ENGINE - Database Management layer

The IO ENGINE serves 3 main purposes:

1. Translation and navigation of requests between the *ALEPH* APPLICATION layer and the *ALEPH* DB layer

2. Translation and navigation of requests between other ("remote") applications and the *ALEPH* DB layer
3. Performance control on top of a standard DBMS.

ALEPH's IO ENGINE implements the object oriented concept of the *ALEPH* system. It is a logical server which provides data services to the APPLICATION It contains a group of objects which intermediate between the *ALEPH* APPLICATION and the DBMS. The IO ENGINE translates an application request to a sequence of SQL commands.

ALEPH's IO ENGINE also exploits the knowledge that the system has about the DBMS's special characteristics to optimize data update and retrieval. It is in the logical layer that *ALEPH* incorporates its experience and know-how of library-specific data structures and formats.

The *ALEPH*'s IO ENGINE layer provides another means of performance tuning: It accommodates a distribution of its services between different hardware servers. For example, services pertaining to the access files can be in a different server than services pertaining to the index files. The IO engine is the layer which controls a scalable hardware solution.

DBMS - Database storage and maintenance layer

Introducing a standard DBMS package is combined with the new design of the *ALEPH* catalog including bibliographic data and the relevant indexes.

The special structure and characteristics of a library database, taking into account the expected very high volumes of data and transactions, excludes an implementation of the catalog in a standard SQL format. In particular, the following requirements are problematic for a standard SQL format:

- No limit on the number of fields per bibliographic record
- Non limited repeated fields of varying length
- No limit of the field length
- Fields containing unstructured subfields
- No limit on the number of access paths to the document record

The *ALEPH* DBMS is constructed especially to deal with these unique characteristics. The adaptation of the *ALEPH* DBMS to national catalog requirements, based on ORACLE, will preserve the know-how and expertise implemented in the *ALEPH* IO ENGINE. Searching by words is one of the most CPU/IO consuming functions in the library OPAC. This is especially true in regard to complex Boolean searches in big databases for a single word which is frequently used (e.g. hundreds of occurrences for a single word entry).

The "FIND" (searching for words) command is one of the most common CCL (ISO 8777 Common Command Language) commands used by the library patrons.

It was therefore decided to integrate into the *ALEPH* database a new WORDS ENGINE that is based on condensed bitmaps and efficient algorithms. This new engine will improve the performance in the case of very big databases.

Summary

The new architecture of the *ALEPH* version 4.0 will provide an optimal solution for the new generation of library systems.

The 4-layer approach incorporated into the *ALEPH* version 4.0 client-server architecture provides the necessary tools for handling the libraries of the future in a fast changing environment:

Comprehensive integrated functionality activated by a flexible graphical or character mode user interface, supported by a standard DBMS package, all while keeping the best achieved cost/performance ratios.

ALEPH distributed architecture (**Figure 1**) provides the necessary tools of libraries by providing a flexible set up of system architecture and a flexible set up of system functionality.

ALEPH Architecture

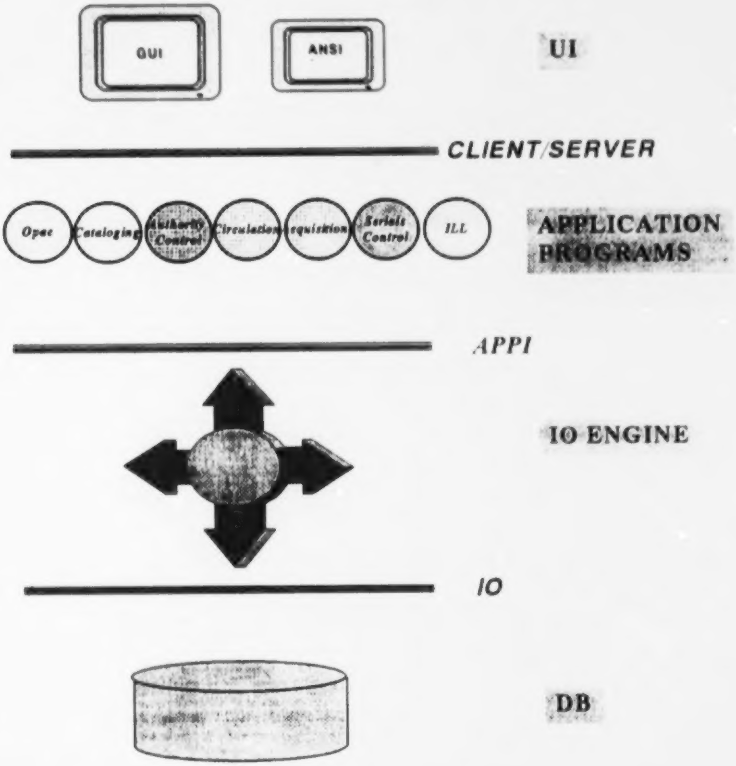
GUI
ANSI
UI
CLIENT/SERVER
Opac
Cataloging
Authority Control
Circulation
Acquisition
Serials Control
ILL
APPLICATION PROGRAMS
APPI
IO ENGINE
IO
DB

Figure 1

Who Pays for Information? And Why should They?

Maurice B. Line

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Maurice B. Line is a consultant, specializing in strategic planning, staff development and the management of change. He retired in 1988 as Director-General, Science Technology and Industry in the British Library, which he served for 15 years. Before that he worked in five university libraries. He is a Professor Associate at Sheffield University. He has honorary doctorates from Heriot-Watt and Southampton Universities, and a fellowship from Birmingham Polytechnic (now University of Central England). He was President of the UK Library Association in 1990, and was awarded the IFLA Medal in the same year. He has written 14 books and 300 articles and papers, covering a wide variety of topics, from bibliometrics to library management.

Abstract

Big changes in the economic and political climate have affected attitudes to paying for the provision of and access to information. However, the scholarly publication system is not a true market one. Nearly all of the costs that occur at the various points in the information production and access chain are ultimately borne by institutions, though research bodies may fund some of them. The interesting question is whether charging mechanisms within the chain can significantly affect the system. Charging users usually results in their institution paying. The market signals given by charging are of limited value; waste may be reduced, but some

waste in information provision is necessary; and it is dangerous to make charges as a matter of expediency rather than principle. The provision of access to users in the Third World should be regarded as an investment in a long term market and in political stability. Information is expensive, but not unaffordably so.

Introduction: The Economic and Political Climate

The issue of charging has become a key one. The reasons are both economic and ideological: economic because governments all over the world are suffering from the continuing recession (recoveries are brief and troughs deep and long), ideological because belief that market forces must ultimately dictate policy has become almost a modern gospel. This belief would not have gained such a hold if Keynesianism had not been seen as a cause of economic failure in the last two or three decades. Now that the weakness of the market philosophy is becoming more and more apparent, there may be a reaction against it; this is already happening in Poland and Hungary, but elsewhere it is likely to be a cautious one, since governments frankly do not know what economic principles do work, and will be reluctant to give up a doctrine that has yielded very good results for the influential few, even if many have suffered.

Whatever happens in the future, so much of the public sector has now been passed to the private sector that it will be impossible for any future government to reverse the process on any scale without bankrupting itself. Also, while we may see some relative increase in public expenditure, this will be slow and cautious. I shall here assume that there is little change from the present situation in the direction either of more privatization or of more public expenditure.

This paper focuses on the question of who should pay for bibliographic databases and full text of scholarly and scientific journals, and only touches on broader issues of whether libraries should charge users for services.

Where are Costs Incurred, and Who Pays Them Now?

Costs are incurred at various points in the publication and access chain.

1. There is first the cost of **conducting research**; this is usually high or very high, depending on the area researched. This is borne by a funding body (which may be a public foundation or a private body,

e.g. industry), or by the parent institution of the author. In the case of a marketable product arising from the research, some or all of these costs may be recovered directly or indirectly from industry.

2. A modest cost is incurred in **preparing a paper for publication**. This may be carried by the author's parent institution or by himself, usually as a "hidden" cost.

3. **Submission for publication** incurs a few hidden costs, but it may also incur payment by the author in the form of page charges. This practice appears to be confined to some US publishers. It is likely that most page charges are paid by the author's institution.

4. Once submitted for publication, the paper is then normally **refereed**. These costs too are generally hidden; referees are rarely paid, though careful refereeing of an article can easily cost £500 in time.

5. The paper is then **edited**. This cost, which can be quite high in the editor's time, is also rarely recovered, though editors may be paid an honorarium; also, many do the work in their institution's time, so that in effect the institution pays.

6. The **publisher** incurs several costs:

   - packaging articles into journals
   - printing and binding (these are of course normally done by printers, but for simplicity's sake they are counted here as publisher's costs, since he always pays the printer)
   - marketing the journal.

   There may be other costs, such as converting the author's disc into the right form.

7. **Agents** sell journals to consumers, mostly to libraries. The publishers sell the journals to agents at a reduction from the retail price, but the agents' costs are recovered ultimately from the purchasers.

8. **Libraries** purchase journals from agents (in some cases direct from publishers). To the purchase price must be added the costs of selection, ordering, chasing, processing, often binding, and storage. To these may be added the costs of serving users, though the service itself is a benefit.

9. Finally, **users** incur costs, mostly in their time. They may also be charged for access, charges they rarely have to bear, as will be noted a little later.

The above describes the chain of publication for a conventional printed journal. With online bibliographic databases and journals, publishers incur no printing and binding costs for material that is available only in this form. Instead of an agent there is usually a host. Libraries save the costs of chasing, processing, binding and storage, but incur access costs, and various staff costs: training (and retraining), keeping up to date, and accounting (cost monitoring can be time-consuming). Users can bypass the library, but in this case they bear the costs of doing so - or rather, their department or institution does.

Halfway between the conventional journal and the online text database is the CD-ROM. There are now many of these for bibliographic databases, and they are accelerating the death of printed indexing and abstracting tools. There are many fewer full text databases on CD-ROM; the best known is still ADONIS, which now offers the contents of nearly 600 journals in the life and related sciences. Nearly all CD-ROMs are leased to libraries for an annual subscription; there is usually no further charge for use. If they are networked the subscription is higher, and is normally based on the number of simultaneous users. (Unauthorized networking is usually easy to detect when technical problems arise, as they often do, and the producer is contacted by, say, several different departments of a university to which one subscription was sold.) The search software may be proprietary to the database producer, but more often it is developed by a CD-ROM vendor, for example SilverPlatter or CD-Plus, so that the same software can be used across a range of databases. Royalties are paid to the database producer on each subscription sold. The pattern of leasing CD-ROMs for a set fee and allowing unlimited use thereafter is being followed by some online vendors[1], who see themselves as otherwise in danger of being driven out of business.

Several interesting points regarding money may be noted (and have been noted by others):

- the publisher does not pay any of the costs of the research, preparation, or refereeing, or often of the editing; in effect, he gets his material free
- the author gets nothing, except perhaps a small token payment
- the author's parent institution gets nothing

- the referees get nothing
- the editor gets little or nothing
- the institution pays twice, for production and consumption.

To make this last point more specific: the publisher is almost in the position of an intermediary between institutions as "parents" of the author, in which capacity they pay many if not most of the costs of production, and institutions as "parents" of the consumer, in which capacity they pay, via the library or department, all of his/her costs of consumption. Academic institutions pay more of the total production costs than industry, because they produce many more articles; the production:consumption ratio must be a lot higher. Institutions are willing to pay the costs of both production and consumption because they need the material - in the case of industry for research and development, in the case of academic institutions because it is their job to pursue research and create knowledge.

Some believe that publishers are exploiting their special position in the middle of the chain, and have suggested that they might be left out altogether - or rather that institutions themselves should take over the publisher's role, not as individual institutions but jointly. As part of this change, the packages we call journals would probably give way to databases of unpackaged individual articles. This would probably prove less costly, since whatever body represented the joint institutions would not seek to make any profit. Whether it would prove more *cost-effective* is not known, since the effects of such a system can only be guessed at. For it to work at all would require a prior near-collapse of the present system, simply because authors would prefer to use the present system while it lasted. In any case, in view of the trend towards outsourcing public sector operations, it seems rather odd to advocate a sort of nationalization of an activity that is carried out at present by the private sector; if it were already in the public sector it would probably be a prime candidate for privatizing. In fact, the institutions would probably contract a private body to do the job for them - in which case the only difference from the present situation would be that the intermediaries would be directly accountable to the institutions.

To return to the present system: there are traces of market elements in it, but any system where one party gets his material free and another pays for both production and consumption is far from constituting a proper market system. It is interesting to speculate what would happen if the costs of production, even if they excluded the costs of research, had to be paid by publishers. Publishers would almost certainly not pay, but if they did the cost of their journals would have to rise still higher, and the market for journals would collapse - unless, that is, institutions paid much more for them than they do now. In this case they would be paying the costs of production at the consumption stage rather than the production stage - their own costs - and thus end up no better off than they started.

The publisher must clearly recover all his costs, or he will go out of business. Some well known journal publishers recover far more than their costs, and a good deal more than is necessary to invest in their future or to subsidize new journals through their infant years. Academic authors can justify to themselves whatever costs they incur (or make their institutions incur) on the grounds that they earn in prestige and possibly in promotion by publishing; at the least they are making their jobs more secure. Referees do the job for free partly for love, partly because it is highly satisfying to sit in judgment on the work of others. Editors are in effect paying for prestige.

The answer to the question "Who pays?" is then a very simple one: in nearly all cases it is "institutions", whatever money transactions take place along the way. The exceptions occur where users are not attached to any institution, in which case the costs are shared between the user (production) and the institution (consumption). The interesting issue is not "who pays?" but whether any charging mechanisms within the chain can make significant differences to the working of the system. The prospect of the institution charging the publisher for input has been considered above as improbable and unlikely to yield helpful results.

There is another alternative, at least for research that is funded by external bodies. As noted earlier, research bodies often fund the research that is reported by articles. It has often been suggested that research grants should contain an element for consumption also, that is for literature searching and use. In all too few cases this happens. It is quite impossible for researchers to calculate in advance how much they will need to spend on literature searching and use; they may find they need to spend much more than they expected. For this reason, as well as to avoid keeping track of all uses and costs, it is simplest to pass the whole amount of such money to the library. Coles[2] points out that a one-and-a-half percent overhead on his own institution's physics research income would more than pay the costs of the journals to which they have access and leave some over for books for students. He is quite clear that research bodies should be the ones who pay. This would not work with all institutions, however, since not many have such a high research income as Coles' (the Imperial College of Science in London).

Coles raises another interesting point. He argues that the total amount of input into the system is large compared with the use made of the material. If this is so, institutions are paying large sums - both production and consumption costs - for material of which they make little use. This is certainly true for any particular institution, which must make little use of most of the contents of the journals it acquires, but I am not sure it is true of institutions as a whole. Much has been made of the very low use made of journal articles by people who confuse citations with uses; the average number of citations per cited article may be less than ten, but according to work carried out by King Research some years ago the average *readership* per article is over 600. Whatever the shortcomings of printed journals, it may be more economic for both publisher and purchaser to print several hundred copies of journals than to make articles available individually. So far no-one knows whether this is so or not, but the economic superiority of individual article supply, once confidently predicted, is no longer assumed. There are also the unquantified benefits of exposure to articles that would not be identified as useful by means of current awareness systems but are nevertheless used when seen. Browsing in journals is still a not insignificant method by which scientists become aware of articles[3].

Should Costs be Passed on to Users?

It is in the later stages in the chain, the library and the user, that a main area of interest occurs. There has been múch discussion about whether the library should pass the costs of access on to users. This debate, a hot one some twenty years ago, might be thought dead, if only because many libraries have accepted charging as a normal procedure, but it never quite died. Budd[4] and Nielsen[5] argued for its revival, and their case is strengthened by the apparent shift from holdings to access. In fact, as noted, even if the library does pass costs on to users they pay only if they are not attached to any institution, or if for any reason their institution will not pay. If they are attached to an institution, the only question is whether the institution pays through the library or through the department: either way, the institution pays.

The main raison d'être for passing charges on to users is that it may make them think more carefully whether they really want an item or not; although researchers do not bear the cost themselves they may have to justify the expenditure to their department. This may be important when institutions are suffering from a shortage of funds, as many of them are. Putting a charge on anything serves several other purposes, even when the money is merely circulating round the system, as it is in the case of access to databases or text. It can control demand. It can deter indiscriminate or "unnecessary" use. It can result in a better service because the library is placed under a financial obligation. It provides market signals, and helps to discriminate between the valuable and the merely desirable.

But this raises more questions. Market signals are admirable when they apply to soap or toothpaste, since all brands serve the same purpose. Once a person is attached to a particular brand he knows that the next bar or tube will be the same; but each journal article is unique. Are users always able to judge in advance what articles are likely to be valuable to them? Speaking as a user, I would have been wrong many times if I had assessed articles on the basis of title or even abstract; what seemed to be long shots quite often proved more useful than what seemed to be dead certs. Admittedly, in the process I have read many more articles which proved quite useless (unless the raising of my adrenalin level is regarded as useful) than I have found gems, but the fact remains that I have found numerous gems over the years.

A fair amount of wastage in the system has to be allowed for, just as many piles of manure are needed to produce useful crops. Charges may, by inhibiting wasteful use, also prevent users from obtaining some useful items. There is no more logic in charging for access to articles and databases than in making users pay for using the library's own collection. This costs a great deal of money to acquire, process and store, much of it is unused, and users often search through many books to find one that suits their needs. Every borrowing transaction costs money - more than most librarians would estimate. I have never heard any suggestion that "wasteful" use of the collection should be prevented, or that users should be charged to make them think twice about consultation or borrowing. Use of existing collections can be, and usually is, regarded as a "good thing", as it increases the utilization of expensive capital resources and reduces unit costs; but if access is to be used more and more as a substitute for holdings, "waste" in access has to be equally accepted. Utilization of the vast resources of knowledge that do not happen to be in the user's own library is also a "good thing", if one accepts the premise that open access to knowledge is a good thing. If it is not, why is so much money spent on generating new knowledge, and why do universities exist? I see no harm in publicizing the cost of access, to remind users that there are costs involved, but I would not go further. (I might want to remind them at the same time of the costs of the collection and of borrowing).

The elimination of waste might seem an obvious good. But nature is very wasteful; many more animals are born than survive for more than a few months, much blossom does not turn into fruit, and much fruit falls from the tree before it ripens. Wastefulness is also common in our own market economies; the need for choice guarantees waste. I would hazard a guess that the average restaurant throws away almost as much food as is eaten. In library terms, this is an argument for holdings as against access, for a reaction against the minimalist library, an argument I would accept for current material at least. A life of minimal exposure to information is as about an exciting a prospect as a life with minimal clothing and food.

Some waste has to be avoided. There has to be some means of controlling online searching, on which much money can be wasted by inefficient searchers. But there are ways of doing this without imposing charges; guidance of inexperienced searchers by library staff is usually desirable in any case.

To return to the question of charging. So far I have been talking as if all users of online databases and CD-ROMs were researchers. In universities this is of course not the case; many are undergraduate students. The arguments against charging apply much more strongly to them, for they almost certainly cannot pass charges on to their departments, and they would be penalized for attempting to do their work better.

There is yet a further argument against charging. I believe, as Lewis does[6], that it is most important for the university library to "establish itself as the information centre on campus" if it wishes to play a major role in the future. Fees undercut attempts to do so.

At this point I expect to be told by librarians that they do not have enough money to offer routine services, let alone provide extra ones; and that they are compelled to charge by hard economic circumstances. I would first dispute the idea that access is a non-routine service; it must be treated as a basic service, especially if we really are moving towards an access strategy. A counter-argument here might be that access to a particular item is specific to a user, while the library's collections are available to all. This I would answer by saying that many items were acquired at the request of one user for his own use, and that every borrowing is also specific. I believe that there are value-added services that libraries can give, but access to remote items is not one of them. (In fact, every library is itself a value-added service, since it selects, arranges and organizes published material to meet its customers' needs; what are commonly thought of as value-added services are really super-value-added).

I realize that libraries are hard up, but to make charges as a matter of expediency rather than according to considered principles is both wrong and dangerous. The dangers can be illustrated by British public libraries, which many years ago started charging for the loan of sound recordings, and now find it hard to offer any logical reason why the loan of books should be free. It is equally illogical to charge for online searches but not for searches on CD-ROMs, or for that matter manual searches done by library staff; all cost money, and the fact that only the cost of online searches is visible should be irrelevant (and may soon cease to be a general fact, as noted earlier). White states well the case against expediency and for forthright advocacy of principle[7]. A recent survey of charging in British libraries[8] shows a great deal of variation in the proportion of libraries of the same type that charge for the same service, and also in whether they charge direct or full costs (although many do not know what their full costs are). As Dunn & Martin say, "Libraries seem to have engaged in ad hoc planning and to have drawn money from wherever possible"[9]. And even if we think only of expediency, the cost of searches cannot be a large percentage of a library budget, and may therefore simply not be worth charging for[4].

Cooper's concept of information as a "merit good", defined as "a private good that society thinks is important enough to be supplied publicly", is attractive, the more so since he arrives at it as the result of an impressive analysis of the nature of information[10]. He adds that "It is supplied by interfering with consumer preferences, because, left alone, the consumer would purchase less than society thinks worthwhile".

There are of course services that can and should be charged for: overdue loans and lost books (if they can be called services), and more especially tailor-made information services that users could render for themselves but prefer to get the library to do for them. Another reason for charging for such services is that they may also be given by information brokers, and it would be wrong to undercut them.

Another question is whether academic libraries should charge departments, not merely for access but for all services rendered to them. Calculating and allocating the value of services to each department is not easy, since many materials are used by more than one department; but nor is it impossible - it has been done in some institutions in the UK[11]. This can be turned round, and departments can contract the library to provide specified services for them. If this is taken to its extreme, the library is left with no budget of its own at all. This system too operates in some universities in the UK, though the library is usually given a central fund of its own. The purpose of such systems is to make the library more accountable to users, or rather their departments. The dangers of wildly fluctuating budgets from one year to another are obvious. It is too early to judge how successful or damaging these systems of financing are. From experience so far, it is evident that some libraries hate it, while some have actually done better out of it.

Charging, even if it merely means moving money around institutions, is attractive to administrators because it is a barrier to use, and the more barriers there are the less use will occur and less money will be spent. Sensible control over the use of money is one thing; deliberate barriers are another. I would once again ask what universities are for - and what percentage of their expenditure goes on access to literature. The answer to the second one is between 1% and 3% in most universities. Whatever arguments institutions may make for barriers, I see no reason why librarians should go along with them.

The logic of Cooper's argument is that information should be provided free to all. Lesk[12] puts a case for this (though it is not clear if he fully believes in it). Why should not information be regarded as a sort of essential infrastructure, like roads, and paid for from taxes? As Lesk says, it is easy and (almost) free to put information on to the Internet and (almost) free to get it off. At least, it *was* easy until there came to be so much of it that some users have given up in despair of ever finding the pearls they want in the swamp. So guides are needed through the swamp, and we find ourselves back at value-added services - the selection, filtering and guiding that publishers and libraries do. One more noble ideal wrecked by harsh reality? But libraries are not publishers, and there is no reason why they should behave in similar ways.

What About Users Who Cannot Pay?

There are many would-be users who cannot pay, or whose institutions cannot pay. I am not thinking here about us well off people in the west; we may be mean, but most of us are not poor. I am thinking of the vast number of potential users in less developed countries who are caught in a vicious circle: they cannot advance much as scientists or scholars, and thereby help their countries develop, because they have very poor access to literature, and their access to literature is poor because their countries have not developed. To break this circle they must somehow be given access to literature free or at heavily subsidized prices. How can that be done?

Assistance should be regarded as investment: investment in a long term market, one that will be able to pay its way in the course of time, and maybe make up for some of the lost sales in the west; and more generally investment in the future stability of the world, since the coexistence of very rich and very poor countries, some of which are actually getting poorer, is already leading to severe immigration pressures in developed countries, unrest within and between less developed countries, and the rise of extremist and fundamentalist movements, trends that are bound to increase.

It is enlightened self-interest for both publishers and governments to help the poorer nations by such investment. Alas, that does not make it any more likely that it will happen. It would be good to think that the Reed Elseviers of this world would spend some of their profits in giving away some copies of their journals to less developed countries; it is not unreasonable to expect this of a wealthy commercial body, especially if it were done in a small way, and if it could be shown that pump-priming of this kind would eventually lead to increased paying markets. I think it unlikely however that they could be persuaded. Nor is it easy to see western governments, which seem increasingly to think only in the short term, giving this high priority. UNESCO has made efforts in this direction, but these have been focused almost entirely on CD-ROMs[13].

Conclusion

I accept that institutions do, and I believe that they should, carry virtually all of the costs of scholarly and scientific publishing; if they can find a more cost-effective way of doing this, well and good. I am opposed on a number of grounds to charging users for access to information. We have to accept that it is costly to make information available, and that it is unlikely that much cheaper ways will come into being; but the relative cost is not nearly as great as one might be led to believe by the fuss over journal publishing, and it should be easily affordable by any developed country. Nevertheless, journal publishers should regard themselves as privileged to act as intermediaries, and use some of their profits to aid access to their material in less developed countries, a policy that would probably benefit them in the long run.

I may be accused of resisting an inevitable Darwinian process - of trying to turn the clock back, of swimming against the tide. But I do not think that the current trend towards the acceptance of market values for everything is inevitable at all; as I said at the beginning, we are already seeing signs of a reaction against it. And I see no wrong in trying to turn the clock back if it tells the wrong time, or in swimming against a tide that is threatening to wash us all up on a barren shore. We have seen what I believe to be vital values eroded over several years, so gradually that it has been hard to protest at any one point in time. You may not agree with my principles, but it is time that *some* principles were uttered and defended.

Let me end by quoting the beginning of a paper I gave over ten years ago, which was published in a collection several years later[14]:

> "It is becoming generally accepted that the future of developed countries lies largely in their becoming information societies, even information economies, deriving most of their wealth not from manufacturing but from the provision and transmission of information, in its widest sense - from primary education to advertising. At the same time, in nearly all of these same countries the resources devoted to libraries, in both public and private sectors, are being cut back, often savagely. Either libraries are doing the wrong things or they have not convinced their lords and masters that they are doing the right things."

If this was true ten years ago, it is even more true now. The final words of the same paper were:

> "Either we believe in what we are doing or we do not: and if we do we should act on our beliefs."

We have a far stronger case than we have yet made.

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Open Library Networking and Interlibrary Cooperation

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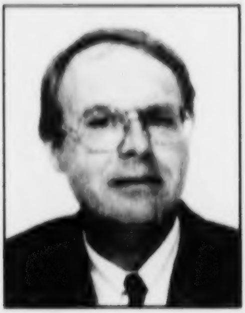

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Abstract

This paper describes the new tasks libraries have to fulfill in the electronic age. Thanks to the improvement of the network and datacommunication infrastructure the partition lines between libraries are easier to overstep. This opens new perspectives for library cooperation and library service.

An illustration is given after the example of the Open Library Network in the Netherlands and its extension to parts of Germany.

It is stated that it is important for libraries to accept, apply and control the new possibilities and to give access not only to the library's own collections, but also to those of other libraries and to other databases. However, giving access by itself is not suffi-

cient to improve library service. Libraries have to adapt their organization and their management to achieve the full functionality of the new developments. The paper will discuss the organizational effects and consequences of the application of open library networks for interlibrary cooperation and for the improvement of library service.

Introduction

Considering the way in which scientists and students use information and publications for their research, one can only reach the conclusion that libraries have lost none of their importance as centers of information. The researcher prefers - in my experience - simply to have (most of) the necessary publications at hand, or at least in close vicinity. This presents a difficult task for the library. For this preference means that the library has to take care, within its financial limits, that the publications most relevant to research, education or society in general are available on the spot.

However, it would not be correct to assume that the only services provided by the library are building up and managing a collection, as if these would be the only important activities. The building up and management of a collection are, indeed, preconditions for an adequate literature provision and a good library service, but its quality is not completely determined by these. Other factors play an important part as well.

The Virtual/Digital/Electronic Library

We may think of things such as: offering electronic access to online catalogues of the library itself and of other libraries, access to bibliographic files, contents databases, CD-ROMs, full text databases, electronic periodicals, image databases etc. One may also think of advanced techniques of making library sources available, new retrieval facilities (supported or not supported by expert systems), document delivery systems, automated literature research and so on.

Saying this, the terms "virtual", "digital" or "electronic library" soon crop up in the conversation. Personally, I regard these as ill-fitting designations, because they are mostly used by people who apparently want to create a contradiction between these new forms of library services and the existing traditional ones. This, however, is not true.

The electronic functions of giving access to data inside or outside the library are supplementary to the traditional functions of building up and managing a collection; together they make up the quality of the library service, of which the making available of necessary information is the most important aspect.

Opposing the concepts of access and ownership is misleading as well. It is not the case that giving access to databases, wherever they may be, makes ownership, the managing of library collections redundant, or even less important. In fact, it is the heart of the librarian's profession to find the right balance between both aspects of library services.

The Open Library Network (OBN) in the Netherlands

Starting from these thoughts I would like to speak on the Open Library Network (OBN), which has been available in the Netherlands for some time now, and I would like to draw some conclusions from it for the setting-up of open library networks in a more general sense.

OBN was developed by the Center for Library Automation PICA, with the financial support of SURFnet, the scientific research network organization in the Netherlands.

The concept of OBN is that the systems of various libraries (starting with the libraries with a local PICA-library system, but also the libraries with local library systems of other suppliers, such as ALS) are linked online with each other and with the central PICA-system.

The mutual links are through the scientific research network of SURFnet. Within this research network PICA implemented the OBN as a logical network. It is end user-oriented and uses a uniform end user-interface, which means that a user can search the online catalogues of all the libraries connected with the OBN and the central PICA-databases in the same way as his own online catalogue.

Since 1993 the OBN has been expanded with direct user access to the PICA file Online Contents database, a large national database with catalogue entries of articles from the 14,000 (currently) most requested periodicals in the Netherlands. Since the middle of 1994 the Dutch Central Catalogue, containing the holdings of more than 200 Dutch libraries, is also directly accessible for the end users.

Through the catalogues accessible by means of the OBN (including the Online Contents Database and the Dutch Central Catalogue) users can directly make a loan request. Moreover, the Online Contents Database is connected with a document delivery system, called RAPDOC, through which articles in an electronic format or photocopies of articles can be sent on demand within 24 or 48 hours to the users at their work or home address.

Because of the infrastructure of the OBN the Dutch university and other scientific libraries, each holding a number of books ranging from some hundred thousand to a few million, and together managing tens of millions of books and periodicals, are starting to function as one big Dutch Scientific Library. Their users can look at the combined collections of the libraries working together in OBN as if it is one large collection from which the desired publications can be requested for loan.

In order to make this a controllable process and to realize a quality service, these libraries have declared their willingness to cooperate. They are prepared to comply with a number of organizational conditions, of which I will speak more later on.

Since September 1994 the FirstSearch files of OCLC have experimentally been made available to users through OBN as well. Besides that, OBN-like links have been made with the British Library, the English LASER system, the French SUNIST, the Lower Saxon BRZN and the files of the Research Library Group. These links, however, are, for the time being, only of interest to interlibrary loan traffic and to cataloguing and are not accessible to users by themselves.

At this moment PICA is in the process of developing a standardized Z39.50 interface with which not only the above mentioned online catalogues can be searched uniformly, but other bibliographical databases as well, such as the database EMBASE of Elsevier Science Publishers' Excerpta Medica. The fact that extensive abstracts form a part of that database makes it necessary to expand this interface with a number of searching and retrieval facilities; so, in addition the Newton Search Engine of OCLC is used. The first version of this interface has been operational since October; an updated version will be available in the next year. The implementation of a graphic user-interface (GUI) is planned for 1995.

OBN in an International Context

Some states in Germany, the Norddeutsche Bibliotheksverbund and the Deutsche Bibliothek have, as you will know, decided to implement the central and local PICA-systems in their libraries. Because of this expansion of the PICA-system to Germany the OBN facilities will also be available there and cooperation with the Dutch OBN libraries will be possible.

Technically this does not give any problems, organizationally, however, some things have to be worked out more thoroughly. A first impulse to the cooperation between the Netherlands and North Germany was, by the end of July, given in Göttingen. A project plan for the realization of this cooperation is at the moment in its final stage.

I hope that the application and connections of open library networks will come about in all parts and countries of Europe. In this way the concept of a European Scientific Library could be given form, within which the libraries connected to such an open network will provide services to each other.

Organizational Aspects and Conditions of Cooperation within an Open Library Network

If libraries want to cooperate within the context of an open library network, then, in my opinion, a number of organizational aspects should be taken into account and a number of conditions should be met.

When formulating these aspects and conditions, I am undoubtedly strongly defined by my own experiences with the Open Library Network realized by PICA in the Netherlands; yet I hope my remarks can be of use when an open library network is implemented somewhere else.

1. General policy aspects of cooperation within an OBN

In order to correctly take part in an open library network the libraries in question need to form a cooperative. In this framework they have to define a library policy, in which the library services to be provided will be sharply defined and the limits of these services will be made clear.

When formulating this policy the willingness should be always there - in spite of the various managerial-organizational situations - to see the autonomy of each library in perspective and to attune service as much as possible to that of the other partners, so that, in principle, the same policies towards users and a uniform library service are created.

Moreover, it should be possible to define special forms of cooperation within a very large cooperative.

It may be important, for example, that **various kinds** of libraries are defined (university libraries, public libraries, special libraries, etc.)

Furthermore, it should be possible to provide **thematic** (for example, chemical or medical libraries) subdivisions within a cooperative.

In very large OBNs it should be possible to form smaller **regional** OBNs. This can be brought about by using for example area-codes in the central database. In the Netherlands we have the regional Amsterdam network ADAMnet. Another possibility is the integration of the catalogues of a number of institutions in one local library system. An example of this is the Limburg library network IHOL.

2. User registration, authorization and identification

Within an OBN cooperative one should be able to differentiate the services to be provided in such a way that these are accessible to different categories of users with different levels of authorization.

In the first place a distinction should be made between registered and non-registered users.

Non-registered users are users who are looking for a connection through a workstation with an(other) OBN library without the wish or the possibility to identify themselves. This group is solely offered consulting facilities, in so far as this does not lead to a bad performance of the library system in question because it burdens the system too much.

Registered users are users who have been authorized by a participating OBN library. A user is registered in the OBN on the moment he has given his lending number at the system's request - and possibly his password and pincode - and this information has been validated by the system. In principal, this identification takes place only once per OBN session, a session being defined as: maintaining a connection with the OBN database in question.

Every library is responsible for the authorization of its individual categories of users. The subdivision of users into various categories should correspond with the subdivision in its own local (lending-)system and should agree with the subdivisions within the other OBN libraries. This goes for the granting of codings as well.

This means that on the basis of lending permission in the local system of the user OBN permissions can be generated for every user category in the systems of other OBN participants.

The decentrally granted level of authorization should in principle be determining for the policy towards users of every library participating in the OBN cooperative.

3. User services

In order to use the services of the other libraries of the OBN cooperative the user has to be a member of at least one library organization within that cooperative.

3.1 Searching facilities

Access to and searching in the internal OPAC and the OPACs of other OBN libraries should basically be free and users should not be charged for this facility.

In the Dutch OBN every library makes available in its local library system 10 logical channels (= 10 simultaneous access facilities) for users of other OBN libraries within the cooperative.

The Dutch Central Catalogue and the central Online Contents database of PICA are also made available for free to users by the OBN libraries. PICA does, however, charge the libraries a certain amount of money for every logical channel. At the moment the rate is ƒ50,000 for ten logical channels.

For reasons of security and controllability a user in an external OBN database cannot dial-direct to another external database. The moment the user wants to access another external database he returns to the OBN menu of his own OPAC and can make a new choice from this menu.

It is recommendable that every library should develop for itself - depending on the spatial situation - a policy for the question which databases should be made available on which workstations, for example:

- workstations within the library
  - only the local OPAC
  - local OPAC + local subdivisional databases
  - OPAC + (local subdivisional databases) + access to OBN
  - other OBN databases only
  - etc., etc.

- workstations on the place of work
  - in principle all facilities.

If the institution has a so-called campuswide information system (CWIS) the OBN databases and other possible databases should be integrated within this system as a logical network. From the user's point of view there should not be a completely distinctive library information system apart from the CWIS.

3.2 Making publications available

An open library network is only of extra value to the user, if besides searching facilities, lending facilities and document delivery facilities are offered as well. This facility distinguishes an open library network from networks such as Internet and navigation services such as Gopher and World Wide Web.

Making publications available the following principles could be followed:

3.2.1 Taking for granted that, generally speaking, interlibrary loan traffic and therefore direct loan requests by users through OBN, will cost money, the user has to open a deposit in advance with his own library.

In the Netherlands this deposit is called the IBL-account. The system of the IBL-account has been integrated in the OBN software.

Another possibility is credit cards following the example of various document delivery organizations in the United States.

The costs of the loan transactions of the user are deducted from his account; his own library guards this deposit and gives the user the information he requires, or provides necessary directions.

3.2.2 Monographs are always sent to the library of which the user is a member, and never directly to his home- or work address. The mother library then lends the monographs received from other libraries to the user, after the data of the book in question and other necessary data have (temporarily) been recorded in the lending system of that library. (In the Dutch OBN such a temporary record is automatically made). After the period of loan is expired, the receiving library takes care that the book is returned in a correct fashion to the library who lent the book.

3.2.3 Articles preferably are sent in photocopy directly to the home or work address of the applicant by the library who delivers these articles. When scanning and electronic mail is involved, the articles should be sent to the electronic address of the applicant.

3.2.4 Electronic documents are delivered on the same conditions as photocopies of articles and can either be sent electronically to the address of the applicant's workstation or printed and sent to an address stated by the applicant. When large texts are involved, this form of service is becoming a kind of publishing on demand. Of course, good information in advance on the costs of the delivery of electronic texts is necessary.

4. Scale of charges/financial settlement

Clear instructions should inform the users which services are offered on which conditions within the OBN. One of these conditions may be the opening of the deposit (IBL-account) mentioned in paragraph 3.2.1.

After opening the deposit a certain amount of money is deducted from it for every loan request. Which charges a library should want to make, can be determined by the library itself and can be assessed by defining the deposit parameters for each loan transaction and document type (monograph or article).

Even though every library is free to stipulate the scale of charges for their own users, it is advisable to harmonize this within the OBN as much as possible.

For the charging of IBL-services it should make no difference how the required document is delivered (by mail, fax or electronically). It is possible, however, to charge extra for rush orders.

The fulfillment of IBL-requests (monographs, articles or electronic documents) is financially settled by the delivering library with the library of the end user according uniform rates. The stipulation of uniform rates for the mutual settlement of IBL-costs between libraries is in my point of view an important condition for the functioning of the IBL-system within an OBN, even though every library is free in stipulating the scale of charges with respect to their own users.

The above mentioned also means that there only is a financial relation between the user and his own library, and no such a relation between the user and the delivering library.

A clearinghouse system for the mutual settlement of IBL-costs between the libraries participating within an OBN on the basis of uniform rates prevents the sending to and from of an endless number of bills for small amounts of money. Within the Dutch OBN such a system has been implemented and will be operational very soon.

5. Technical aspects

It is not necessary for the participation within an OBN that every library should have the same local automation system (for example PICA), but it is essential that the participating libraries use software packages with (international) standards (such as the Z39.50/SR protocol) and that their computer configurations are based on a client/server architecture.

An OBN should basically be open to every library with a local library system of their own, and they should give other libraries access to their databases on a reciprocal basis.

When various OBNs are connected with each other, a central gateway structure is preferred, especially from the point of view of regulation of loan requests and document delivery transactions. In the North German-Dutch OBN cooperatives, for example, the central configuration of theBibliotheksrechenzentrum Niedersachsen in Göttingen (BRZN) and the central PICA-configuration in Leiden will function as central gateways between the OBNs in North Germany and the Netherlands.

Final Conclusions

The managing director of PICA, Look Costers, introduced in his lecture at the symposium 'Library Networking and Electronic Media' in Bielefeld, held in February 1994, the concept of Controlled Network Information Environment and mentioned in connection with this two levels of service. The first level of service refers to the services the library itself can control and directly offers to their own users. This concerns on the one hand the systems used by the library itself and on the other hand the (local or external) databases and information services the library provides to its users on its own and via a standard user-interface.

On the second level the library provides services within the framework of the cooperative of which it is part through an open library network. For the provision of these services my former remarks are meant.

According to Costers, Internet could be considered a third level of service, but - as he justly remarks - it does not form a part of the Controlled Network Information Environment. "It forms an uncontrollable infrastructure, which causes the quality of the service not to be guaranteed".

In my opinion the possible use of electronic access to databases within and especially outside the library as such, is very often overrated. If these possibilities are not connected with facilities in the area of services, preferably directly to the users, profit is small and the effect very often even negative: being able to see where all kinds of information are, but not being able to get this information, does not lead to a large user satisfaction. This is the reason why libraries have the task to apply in a practical way the new assets of the information technology and to integrate these in such a fashion within the library policy that user service is brought to a higher level. I hope that this lecture contributes to further thinking about this subject.

Evaluation of Networked Information Sources

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Abstract

Suggests techniques and evaluation criteria for information sources and services available over the Internet. The need for qualitative judgements about library materials and information sources is upheld and accepted techniques and evaluation criteria for printed reference works are outlined. The emergence of non-book materials

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and electronic information formats has created the need for new techniques and criteria relating specifically to online services and CD-ROM products.

Use of the Internet by library and information workers is examined, establishing that the majority of current traffic is communications-based. Over the last twelve months there has been a marked growth in interest in the Internet generally and rapid developments in the technology used for accessing the network. Distributed client-server computing has the potential to facilitate use of the Internet as a global information resource which may be searched in its own right. The implications of such technology are examined in relation to the possible impact on the use of the Internet by information professionals.

The authors suggest that networked information sources require the development of additional techniques and criteria for evaluation if they are to be used by information professionals. The potential issues in establishing such a list are discussed.[1]

1. The Evaluation of Information Sources

1.1 Background

From the beginnings of librarianship as a profession, the need has been recognised to make qualitative judgements about library materials and sources of information. As long ago as 1876 Melvil Dewey suggested it was no longer enough for a librarian to be merely a keeper and protector of books. They needed also to see that the library contained, "the best books on the best subjects, regarding carefully the special wants of his [or her] community."[2] Over a hundred years after Dewey wrote his piece, contemporary reference librarians maintain the need to evaluate material:

> The evaluation of reference books, whether in terms of an initial decision to acquire them or a subsequent decision as to their utility, is an important element of our professional work.[3]

Jesse H. Shera suggests that from the time libraries became "public", librarians have formed, "certain basic propositions fundamental to a systematic statement of the role of the modern library in contemporary society", the first being that the book or graphic record is "the central concept of an acceptable theory of librarianship" and the second, "the processes of selecting, acquiring and making available for use the graphic record."[4]

For several decades, the idea of there being a "core" of librarianship has been discussed by the profession; in 1949, Jeriam P. Danton claimed that there is "a probable indispensable 'core' curriculum which must be embraced by any library school"[5] and in 1954 a workshop held at the University of Chicago concluded, "the group felt strongly that the defence of librarianship as a profession must rest in its possession of a common, central body of knowledge".[6] In both documents, the principals and practices of the evaluation and selection of materials is seen as a core activity of librarianship, felt to be an essential function of the profession.

Recognised and widely used techniques for the examination and criteria for the evaluation of printed reference works have been in existence from about the turn of the century. Alice B. Kroeger's *Guide to the Study and Use of Reference Books* of 1904 included a section outlining a technique for examining and making an informed estimate of the value of any work:

> The student should first read the title page and preface or introduction of each reference book, where the purpose of the book is usually stated. Then examine the book for special features, including indexes, cross-references, bibliographies, etc. Several articles should be examined and compared with those on the same subjects in another reference book.
>
> Additional points to be noted are: the authority for the article, its arrangement, the date, the treatment of the subject, whether technical or popular, whether concise or extended.
>
> It is not sufficient that titles of reference books should be known to the student, but systematic study should be followed by constant reference to the books by means of set questions which must be looked up thoroughly.[7]

Kroeger's work, and the techniques she laid down, were later expanded by Isadore Gilbert Mudge in 1923 in her *New Guide to Reference Books*.[8] The relevant pages from the introduction to Mudge were reprinted in subsequent editions edited by Constance Winchell and Eugene P. Sheehy, until the ninth edition of 1976.[9] Kroeger and Mudge's criteria have largely remained intact and accepted by subsequent commentators writing about printed reference works, appearing in the first text-book on reference work[10] and the first bibliography on the subject.[11] Criteria in use today, (notably by William A. Katz[12] in the USA and Gavin L. Higgens[13] in the UK), remain largely the same as those used by Mudge and Kroeger, albeit with a slight discernible change of emphasis between authors.

1.2 Non-book Materials and New Information Formats

The emergence of non-book materials generally, and electronic information formats in particular, has created a need for new techniques and evaluation criteria appropriate to those formats. Authors such as J. A. Large[14], and more recently S. Norman[15], have discussed the problems of establishing accepted criteria for the evaluation of these sources. For example, Norman notes the difficulty of examining online sources and CD-ROM products in detail since they cannot be browsed in the same way as print. Also the indexes are often harder to assess, and with online sources there may well be time and cost restrictions. Similarly, as noted by Large, the purpose of such works is harder to establish as electronic sources tend not to have such features as an introduction, preface or table of contents as a guide and it is difficult to establish the authority of a work because there is unlikely to be a statement of responsibility as is frequently to be found in printed works.

Despite these problems, there now exists a considerable body of literature relating to the evaluation of online services and CD-ROM products, both in terms of quality of the information contained and also the means of access to them. For example, Large suggests traditional criteria for the evaluation of printed reference works only "incidentally" apply to many electronic sources of information, but he nevertheless uses criteria set out by Katz as a point of reference to establish his own criteria.[16] Large proposes examining online services in relation to three areas:

- the databases (scope and authority, currency, accuracy, the uniqueness and comprehensiveness of coverage, searching facilities available and support services provided),
- the hosts (search software available, charging policy, availability, number of databases available and support services) and
- the telecommunications networks (cost, reliability and ease of access).

To establish this information, Large suggests consulting available documentation, examining the history of the service providers, combined with practical experience using the relevant services and comparing them with other similar sources.

V. Harry and C. Oppenheim identify criteria specifically for CD-ROMs under eight headings:

- general description (type, edition, producer, price, update frequency, print and online equivalents, etc.),
- technical specification (configuration, use of standards, ease of installation and network compatibility),
- documentation and support (operation support, installation manual, user manual),
- the database (coverage, record layout, comprehensiveness, currency),
- the user interface (producer, type, options available, special facilities for online support, screen layout, instructions and prompts),
- searching facilities (software producer, use of Boolean logic for term combination, truncation, adjacency and proximity searching, case sensitivity, indexing, search speed, display facilities, etc.),
- output facilities (functions available, screen output, downloading facilities, sorting and printing) and
- reliability (error handling, error recovery and restart ability).[17]

Broadly similar criteria relating either to online services or CD-ROM products can be found in Katz, Gail K. Dickenson[18], C. J. Armstrong and J. A. Large[19] and Lois Granick[20], although frequently with additional features considered to be worthy of examination. For example, in relation to online services, Katz mentions the retrospective capacity of databases, the amount of information provided (citations only or are abstracts included) and whether full locations are given for cited material.

The object of this paper is to examine the extent to which these criteria may be applied to one rapidly developing source of reference information - the Internet.

2. Reference Librarians and the Internet

2.1 Current Use of the Internet

The ethos of institutional co-operation and the making available of information to all those who have need of it, is the philosophy which underlies the success of the Internet. The Internet is dependent upon the acceptance of certain agreed international standards and protocols, the most important being TCP/IP, which is the basis for the exchange of electronic information over different networks. Other standards relate to the format in which the information is stored and accessed, such as HTML, the hypertext mark-up language which underlies the World-Wide Web, or FTP the file transfer protocol which enables users at one site to retrieve files from another. Similarly the Telnet protocol enables users at one site to login to and interrogate other computers. This unique example of international co-operation has enabled the development of an enormous facility for sharing information between users. Equally, interlibrary co-operation, the sharing of information and acceptance of agreed standards and procedures is an essential component of contemporary librarianship. Therefore, it is not surprising that librarians and related information professionals have been among the first groups to use the Internet in a systematic way; "librarians have been pioneers on the Internet, aggressively exploring its rescurces and sharing what we find".[21]

Until recently the Internet has been seen primarily as a global communications channel. Librarians have been using remote login to one another's OPACs and bulletin boards for many years, although access has depended upon their knowing what was available and how to make contact through various electronic relays and international gateways. A further way of exchanging information is between the users of electronic mail and members of electronic discussion groups which are also available over the network. Academic and Special Librarians in particular have been quick to take up these facilities, and electronic mail has been seen as an important way of overcoming the professional isolation experienced by some librarians working in small or highly specialised information units.

A survey conducted among Special Librarians during the Summer of 1991 indicated that by far the heaviest use of the Internet was for "work-related communication" or electronic discussion forums. However about one third of users were using the system to login to remote databases and approximately an equal number used it to retrieve files, which might range from shareware to the texts of reports or journal articles.[22] Similarly a survey of the use of medical information on the Internet by librarians specialising in the health sciences showed the majority of use was for electronic mail and consultation of bulletin boards.[23] Thus the Internet has been seen as a way of sharing knowledge about what information sources are available and from where.

rather than as an integrated global information resource which may be searched in its own right. However both surveys referred to above showed a small but growing percentage of use was for more targeted information retrieval. At the same time Sally Kalin and Roy Tennant in an important early article, identified some of the types of information available and potential uses. They prophesied that "as more information becomes available on the Internet, the importance of network resources to reference services will increase as well".[24]

2.2 Distributed Client-Server Computing

The development of distributed client-server computing over the last few years has made some fundamental changes to the way in which users can gain access to information over networks. The design of the user interface, which for years has been a major stumbling block to the growth of use of electronic information services, need no longer be the province of the information providers, nor limited by the lowest common denominator of terminal standard. Users of services may now work with their own local client-processor handling interaction with the remote information servers. In this situation only one type of retrieval software is required to access a range of different systems. Gopher, an example of distributed client-server computing, has been described as an attempt "to create order out of chaos".[25] Client-server computing has led to the development of information retrieval tools which operate over the network, searching for files or directories with names which satisfy particular criteria, such as Veronica. The user is no longer dependent upon prior knowledge of what is available but may now interrogate the resources available over the Internet.

The potential availability of global electronic resources is quite staggering. However, so far the process of searching and retrieving information has been rather hit and miss and can be time consuming. The early versions of most UNIX based client-server retrieval tools are fairly crude, particularly when compared with the facilities now provided by online hosts or on CD-ROM products. They have also been text-based, when increasingly networked information is available in a variety of formats. With these tools any files containing images or sounds must be passed on to different categories of software to be output.

In spite of the limitations of network retrieval tools, there has been a growing use of the Internet by reference librarians seeking out information which frequently is not available from traditional printed tools, or even from the newer generation of electronic equivalents. It is also beginning to be seen as a way in which information may be accessed and distributed by government[25] and commerce. Already there are thousands of potential information sources and services available and the number of users and information providers is growing rapidly.

2.3 The World-Wide Web

The development of the World-Wide Web (WWW), "an effort to organise information on the Internet plus local information into a set of hypertext documents"[26] has added an extra dimension to searching the network. The WWW provides subject access using hypertext linking between different parts of a file or between different files in different locations. Initially, WWW readers were text-based only, but the recent availability of a range of inexpensive and user-friendly software has heralded the beginnings of a dramatic improvement in usability of the Internet as an information resource. One example is Mosaic, a WWW reader which works in conjunction with other system tools. Using Mosaic, files may be quickly located and retrieved and then displayed with full integration of text, graphics and sound. Once displayed they may then be searched.

> Mosaic is a way to pull together documents, Internet search tools, scientific data and other files under a single framework .... Mosaic proves that there are no boundaries to reaching text, graphics, audio and data.[27]

These developments will no doubt result in many more users and information providers taking advantage of the facilities available. The Internet is increasingly becoming a focus of attention by all those professionally concerned with the provision, collection, distribution, and retrieval of information including both librarians and publishers. At the same time, the last twelve months has seen considerable exposure of the potential of the Internet in the mass media, centring upon issues such as the enormous range of information potentially available, as well as issues such as the dissemination of pornography, unsolicited advertising and copyright. Thus the interest in the global network, by both professional information workers and the general public, is likely to continue to grow. The Internet is also likely to figure as a major tool for reference librarians.

3. Potential Advantages and Disadvantages of the Internet as an Information Source

There are already several examples in the published literature of the experiences of reference librarians searching the Internet to answer enquiries in preference to using other more traditional printed or electronic sources.[28, 29, 30] In many libraries, exploring the information resources of the network is still seen as a novelty, although increasingly some users are finding that it holds information not readily available elsewhere.

The single most pressing argument for using the Internet as a reference source is the vast quantity and variety of information available. The resources are growing at a rapid rate as more networks accept TCP/IP and more users become registered on existing networks. At the time of writing, the latest figures suggest the following statistics:

- 2,000+ anonymous FTP sites holding several million files
- 2,000+ Gopher servers with an estimated 1-2 million file and menu items
- 3,000+ electronic mailing list discussion groups
- 3-5,000 Usenet Newsgroups
- Several hundred WAIS databases
- 700-1,000 library catalogues
- Hundreds of commercial online services, "free-nets", government and private Bulletin Boards.[31]

Potentially, libraries will have access to a far wider range of information than would be possible from individual collections or traditional online services. As mentioned already, the information available is also varied in terms of format, including text files, computer software, sounds, images, and increasingly, multi-media documents. Using new tools such as Mosaic, libraries may provide the type of information access previously available through the use of CD-ROM.

A further benefit would be the greater speed and ease of accessing information, removing the need for libraries to maintain little used but important holdings: after surveying the use of the Internet by health science librarians, Lois Weinstein concludes that the Internet allows "... 'just-in-time' access to databases, catalogues and texts rather than purchasing these materials 'just-in-case'".[23]

Two other advantages of using the Internet are the currency of the information provided and the relative inexpensiveness of obtaining it at the point of use. Both of these issues are discussed in the succeeding section along with other evaluation criteria.

At the same time, there are also a number of disadvantages associated with accessing information over the network, of which users should be aware. One of the most frequently cited problems is the difficulty of actually knowing what exists and how to get to it. The Internet is essentially a vast network of networks, potentially world-wide in scale. There is no form of centralised provision or control of information and coverage could be described as fragmented (updating is not necessarily consistent and may be done on an ad hoc basis). As a result, much information found on the Internet is either chanced upon, cited elsewhere on the network or else heard about through word of mouth:

> Identifying valuable resources can take detective work or access to an appropriate grapevine. When the networks were small, the grapevine was reasonably effective; but success and growth generate new challenges.[32]

As with printed reference works, familiarity with a given source leads to more efficient and effective usage. One useful tool which is beginning to appear in network reader software products, such as Mosaic and FTP, is the ability for users to store their own preferred list of useful locations and link directly to them.

Use of the Internet relies on access to sophisticated computer and communications technology, particularly if users wish to make use of the full range of services available, such as images and sound. The development is therefore tending to increase the gulf between those libraries and users which have such access and those which do not. There are also the associated problems of rapidly changing technology as an array of new tools has appeared, each of which is being constantly updated. While the use of shareware and freeware reduces the cost of products, there are implications regarding training and instruction for use, particularly if libraries envisage providing direct access to end-users.

While speed of information provision can be advantageous, it can also cause frustration. The speed at which documents may be located and retrieved depends on a number of factors such as the time of day, where the information is located and the overall volume of traffic over the network, as well as the speed of the communications links used by the individual user. If the Internet is to be used as a convenient means of information access, library users are unlikely to want to wait.

Further disadvantages include the volatility of the information provided, the difficulties of ascertaining the pedigree, and the absence of a context in which to judge it. Information provided over networks may not only be altered by the originating author, but also potentially by anyone who has access to it. Thus one might envisage a situation where information made available to the network in good faith may have deliberately altered or sabotaged with disastrous effects. Other problems or potential issues which may need to be addressed with the development of the network could be such matters as protecting personal privacy or commercial security and copyright. There is also likely to be a need for some body or bodies to take responsibility for creating and maintaining archives and also for providing some form of indexing and guidance. Since these matters relate to the evaluation of networked information they are discussed in the succeeding section.

4. Suggested Criteria for the Evaluation of Networked Information Sources

James Rettig, referring to the introduction of CD-ROMs into libraries in the late 1980s, claimed,

> For years people have dreamed of an entire library that would feature such convenience, one in which a user could pose a request and the needed information would appear after a few strokes at a computer keyboard. As more systems .... take their place in libraries, the need for reference librarians to be reviewers, to apply and to share their knowledge will increase.[33]

Similarly, although there are many potential benefits in using information services provided over the Internet, there are also many problems and issues requiring the knowledge and skills of information professionals, as well as those of computer scientists. One of the most basic of these is a need by those who would wish to use the information provided to develop techniques and establish criteria for the evaluation of networked information services.

> Because reference use of Internet resources is still very much in its infancy, there is a major gulf between our knowledge of the existence of these resources and the evidence of their efficacy.[24]

Some of these will be extensions or adaptations of the existing criteria referred to above, while others will relate only to networked information services.

4.1 Authority

The information provided over the Internet is often of an unknown pedigree and its accuracy or reliability may be questionable. Information posted on to the network does not go through the same rigorous review procedures as information which has passed through formal publishing channels. The facility has been described as "clogged with too much junk to make its use effective" and the information "ephemeral and of questionable quality."[34]

Items may be added to the network directly by their originators, or else they may be posted to bulletin boards or electronic discussion groups by others. On occasions it might be difficult to determine the originating institution or individual for an item. Hence the Internet has been criticised as having the potential for misuse through the dissemination of inaccurate or undesirable material.

Material may also have been compiled or opinions expressed to "test the water" or "fly a kite" before authors commit themselves in some more permanent form. This is a perfectly legitimate use of the facilities of the network, but it is important that anyone receiving or using this information second hand should be aware of its status. It is essential therefore to determine intellectual responsibility for any information source, as well as to know from where or by whom it is being disseminated.

Thus a first question is to discover whether an individual or an institution has taken clear and unambiguous responsibility for the compilation of the work. If so, what is known of the status, qualifications or reputation of those concerned? Similarly, if the material has been disseminated by means of a bulletin board or discussion group, has it first been moderated or otherwise refereed?

Further questions would determine whether the file or information source is regarded by peers as being authoritative in its area. For example a newsgroup[35] which is widely read and receives contributions from many sources may be regarded as being more reliable than another, yet at the same time, large and all-embracing newsgroups might be less generally helpful to a searcher than a more specialised equivalent. One of the great advantages of information available over the network is that it is relatively easy, using public domain software, to monitor the overall volume of use of various services[36]. This may be some indication of their authority.

Similar kinds of questions may be posed when considering the retrieval of software, much of which is deliberately made available freely at FTP sites in an untested state in order to solicit feedback or identify bugs. Potential users should be able to ascertain who has written it, and if it has not been fully tested, they should at least be able to assess the risks they are taking by using it.

4.2 Genealogy

Determining the genealogy of a printed source of information is a relatively straightforward task. Succeeding editions or impressions of a work will usually be identified, frequently with an explanation in the introduction of changes made. However, electronic information is inherently far less stable than printed equivalents, and the material posted is provided without a recognisable context making it hard to establish the pedigree or degree of accuracy.

There may be continual small changes to update or correct a given file which are not always immediately apparent to users. Alternatively files may be moved, renamed, or removed altogether without warning. The volatility of information can be both an advantage or a disadvantage depending upon the situation, but as mentioned before, it is important for potential users to understand the status of the information they are using. Software exists which will compare two versions of a file and identify any changes, although this would be a cumbersome task. Alternatively some information sources on the network deliberately maintain introductory files including FAQs (Frequently Asked Questions) which would serve similar purposes to the introduction of a printed reference work.[37]

Textual and graphical information may have come on to the network by a variety of different routes. For example a file might have been deliberately compiled or produced for this method of dissemination, or else it may have been compiled electronically as part of some other publication process and the electronic version exploited as an afterthought. Equally the information may have first existed in a printed form and subsequently been digitised - perhaps without the knowledge of the originators. Some of the electronic reference sources on the network are not the current versions of the same title, which are available in print or commercially online, but rather electronic versions of earlier editions. For example the Project Gutenberg version of Roget's *Thesaurus* available at various sites on the network, is the 1911 edition, now out of copyright and therefore available at less cost than a current edition. Thus it may be important to determine the history of the information source, how long a particular file has been available and where it came from.

4.3 Scope and Treatment

The scope of a printed work would include such matters as the general purpose, its level, date and precise subject coverage and degree of currency. The treatment would deal with such matters as the overall accuracy of the information, the objectivity of any arguments or claims and the general style in which it is presented. Clearly all of these factors are interrelated to some degree; the currency affects the accuracy of the information, and the level of coverage will inevitably influence the general style in which it is presented.

These issues are more difficult to establish for electronic information sources and services, and particularly for material retrieved from networks, than would be the case for printed works. This is partly because the information is often not set in a traditional context, and also because it is less formal, less subject to traditional review procedures and less likely to cite the sources from which it was compiled. Furthermore, as referred to above, the frequent lack of prefatory matter in networked information adds to the difficulty of forming an assessment of it.

4.3.1 Purpose

The potential information user needs to know the intended purpose of any source. If any introductory material to an information source or newsgroup exists, then clearly this is a good starting point to determining its purpose. There may be an online "Home Page",[38] a file of FAQs or an introductory file made available at the time of subscribing to an online discussion group. If these materials are not available then the user is frequently reduced to the cumbersome task of browsing the material online.

4.3.2 Coverage

A similar problem exists when seeking to discover exactly what a given source aims to cover and what are the limitations which may have been imposed at the outset. The same techniques to those described above would therefore need to be applied. In addition, the name of a newsgroup or bulletin board may indicate the depth of coverage of a subject.[39]

One important matter to establish with printed works is the level of overlap, if any, with similar titles. Once again this is much more difficult to establish in the context of a distributed international network such as the Internet. Inevitably there will be a large degree of overlap between various sources, and frequently the same file may be available from a number of different sites. Since most of the users are not paying for the information they receive, arguably this is less of an important issue. However, blindly searching the Internet can be extremely time-consuming and is therefore expensive. Users will wish to identify those sites and sources of information where the most comprehensive and accurate information is likely to be available.

A further consideration is the consistency of coverage. Are topics dealt with consistently and is one area dealt with in detail and another very briefly? This is even harder to establish since most of the material so far available depends upon what other users have decided to post on to the network. However, whereas it might be difficult to determine the consistency of coverage of an individual source of information, these judgements might usefully be applied to the material provided by a given site or WWW server.[40]

4.3.3 Currency and Methods of Revision

In theory, the Internet has the potential to provide the most current information possible; users have immediate access to bulletin boards, electronic mail and news groups within their particular specialisation, providing current awareness information as it happens. Raw data, research reports, surveys, etc. may be posted on to the Internet directly from a word-processor, and made available for public access long before they would if they were published through "formal" printed or electronic channels. News of continuing developments or unfolding events may be disseminated almost instantaneously - such as the use of usenet to disseminate information about the massacres of Tiananman Square. Although specialised printed formats such as newspapers have been developed to cope with time-sensitive information, these cannot possibly compete with networked alternatives.

However, just because a technology provides facilities to keep material up to date, it is not guaranteed that the information provider has taken the trouble to do so. It is equally important therefore for a user of networked information to be able to establish its currency, the frequency of update and whether this is done on a regular or ad hoc basis.

Most computer transactions are in some way automatically date-stamped when they are altered and therefore it ought to be possible to assess the timeliness or currency of the information by examining the date of the file. In some situations it is possible to select material over the Internet according to the date of its creation, although currently this is generally only in situations where the information provider has chosen to make this information available.[41] However, reliance on such factors as automatic date-stamping could be misleading; just because a file has been recently updated, does not automatically guarantee that the information it contains has been brought up to date.

It is also important to determine what happens to superseded information which is removed from the network. Some sites will relegate it to a searchable archive whereas it may disappear from others altogether. If the Internet does continue to develop into a major information source containing information unavailable elsewhere, the issue of archiving networked information is one which will need to be addressed in a more systematic manner than has so far been the case.

4.3.4 Accuracy

Much of the information currently exchanged via the Internet is of an informal and more tentative nature than equivalent printed sources. As a means of communication the Internet has obvious advantages in terms of currency of the information, but equally the degree of informality must make the material suspect to some degree in terms of its accuracy and reliability. There is a tendency for researchers only to use the network for informal or semi-formal communication, relying upon traditional means of dissemination such as the printed treatise or journal article for their final statement on a given subject. This is because material disseminated by means of electronic sources is not awarded the same degree of credibility or status by the scientific community. In order for information disseminated over a network to gain such acceptance it will be necessary to establish review procedures to verify the accuracy and determine the reliability of results. Unfortunately these will tend to slow down the dissemination procedure and thereby remove one of the major advantages.

The traditional means of establishing the accuracy of any work is either to check any references made or other sources of information cited, or else to examine in detail some aspects in which the user has expertise. However, when examining electronic information, when citations are given they will sometimes refer to other electronic sources which may be of the same questionable reliability, or no longer available, or may have been subject to revision or correction since they were cited.

Reference works on evaluation suggest that another means of determining accuracy would be to examine a text for typing errors or inconsistencies in the use of abbreviations or citation of sources. With the advent of spell-checking software this would be a relatively easy task. However, given the nature of networked information, the speed at which it is produced and the varying keyboarding abilities of those who produce it, this is perhaps a less useful measure.

4.3.5 Objectivity

The question of bias and objectivity in traditional reference sources is one which has concerned librarians for some time, both in terms of authors and linguistic factors. Many famous sources are now regarded as being biased towards the concerns of white, Anglo-Saxon, middle-class males at the expense of other groups. Hitherto network usage has been available to members of academic, government, and business communities, with access to the requisite computing equipment and a knowledge of the English language. These factors lend suspicion to the perpetuation of such bias.

The ability of any network using TCP/IP to connect to the Internet has the potential to broaden the information base as more countries and groups of users gain access. Furthermore, many of the means of dissemination over the network do allow for participation or discussion by anyone, thereby tending to lessen the effects of such bias. However, frequently current software restricts the use of the network to those languages which can be accommodated by the current range of ASCII characters, again perpetuating a traditional bias towards the Western world. However, the global nature of the network does require the use of a universally accepted language and by default, the English language seems to be assuming that role. It would seem that this is an issue which must be addressed, but at present it appears to be difficult to establish criteria to judge this issue.

4.3.6 Audience

The way in which information is presented must be appropriate to its intended audience in terms of style and complexity of language and the ideas expressed. Until recently, the means of access to the Internet have required a degree of technical ability and computer knowledge on the part of users. This factor together with the largely academic background of users, has had implications for the type of material available and the way in which it is presented. There is a preponderance of highly specialised and technical information, usually assuming a prior knowledge of the subject, although presented with different degrees of formality depending upon the circumstances.

However the development of user-friendly access tools, the moves towards providing access to a wider variety of users, including schools and public libraries, and the interest in the network as a means of publishing information commercially, will tend to broaden the range of information available. In future, if a wider range of information is available, users will need to be able to assess the intended audience and the degree of formality of a given source to ensure that the information matches their need.

4.4 Format

The format of a printed work relates to the means of delivery (i.e. whether book, newspaper, periodical), to its size and shape and the binding. Users need to determine whether the format of a printed work is appropriate to their intended purpose. With regard to electronic information, the issue of format is more dynamic as new hardware and software products are developed. For example there is a fundamental difference in format between information on a CD-ROM and that provided by an online service, yet both may look very similar when eventually presented on the computer screen.

The issue of format regarding information from the Internet will be to some degree determined by the means of access and the equipment used, and is not necessarily the responsibility of the information provider. There will also frequently be several different means of access to a single source. For example, a file may be retrieved using hypertext from the WWW, where the same information retrieved by FTP or Gopher would have less sophisticated features.

The user interface is of crucial importance in determining the usefulness of electronic information sources and a great deal of research has gone into the design of interfaces to online services and CD-ROM products. However, as mentioned above, the advent of distributed client-server software takes away some of the responsibility for interface design from the information provider, but not for its structure. It is necessary for the information provider to determine the general layout of a document, and for those written in HTML, to establish the hyper-text links. The Internet may be accessed using a variety of interfaces such as under Windows or X-Windows, by means of menus from a Gopher, or else directly using the UNIX command line.

4.5 Arrangement

The arrangement of the information and the means of access provided are fundamental to the usefulness or otherwise of any printed source. This is because material can only be presented in a single linear fashion. It is the arrangement which provides a systematic means of access. The compilers of any reference work must first determine the arrangement most likely to satisfy the majority of users needs and then create a range of subsidiary apparatus such as indexes, tables of contents and cross-references to provide access to the information contained. Furthermore, the layout of the page (including citing of illustrations), the use of colour and the typography used also serve to assist in the process of browsing and locating information. A well designed and laid out printed book is browsable, legible and easy to use. Even the most advanced computer information retrieval systems have still not yet matched the printed book in these respects.

One of the great advantages of textual information in an electronic form is that arrangement is no longer so crucial since the computer can search and sort information at will. Thus the compiler of the information source does not need to foresee how future users may wish to gain access to it. Further advantages may be gained from the ability to download it in a machine readable form for further processing. Yet at the same time, the use of plain ASCII text loses much of the benefits of typography and layout and whilst it is easier to search, it is significantly harder to read and assimilate.

The Internet not only contains a wide variety of different kinds of information with various levels of structure, but also may be accessed through a variety of different retrieval tools of varying sophistication. The issue of arrangement and location of the material is of less importance than the mechanisms available for its retrieval, which may vary depending upon the source. For example the use of the network to login to an OPAC is likely to provide the user with a range of fairly sophisticated software facilities. On the other hand much of the available information in the form of archives of files has little or no means of identification of their contents beyond the file name. Only crude retrieval tools exist for this group such as Archie and Veronica.

There is however a general need for guidance and sign-posting of the Internet resources. There have been recent developments in this area such as the establishment of various electronic libraries which provide access to resources under subject headings, and also automated search and retrieval tools such as the WWW Worm.[42] There is also evidence that library and information professionals are beginning to address these issues - for example, the recently established CATRIONA project on cataloguing and retrieval of information over networks funded by the British Library.[43]

4.6 Technical Considerations

Technical considerations are not really an issue when evaluating a printed reference source, but have been considered to be of great importance with other forms of electronic information because they frequently determine the performance and availability of them. Technical factors which have been considered when evaluating online services and CD-ROM products include the ease of installation and use, the hardware requirements, and when considering online services, their reliability.

These matters also figure to some degree in the decision of whether a library will make use of the Internet as a reference source. The Internet as a whole is extremely robust and reliable since a message may reach a given destination by innumerable paths and is not reliant on any single communication channel being operative. As with any communication chain however, it will be only as strong as its weakest link, which may well be between the end-user and the nearest network node. There is also no guarantee that a particular part of the network will be available for access at a given time, or that an institution which provides information on one occasion will continue to do so.

4.7 Price and Availability

Unlike traditional sources of information, the question of charging is not currently an issue with users of the Internet, most of whom gain access free (at least of the point of use). Also much of the software used for gaining access has been made available freely or at reduced cost. However the whole issue of charging and the commercial exploitation of the facilities afforded by the network has been the subject of heated debate, both over the Internet itself and also in the mass media. If the network is used as a way of disseminating commercially published information, or that which has a potential commercial value, then some form of charging at the point of use is almost inevitable. Future users will need to compare these charges with those for alternative sources, taking into consideration the relative advantages and disadvantages of each means of delivery.

The issue of the mechanisms by which individuals are charged is also one which is under consideration. The way in which the Internet has developed has not easily accommodated the restriction of service to identifiable user groups with passwords, and to whom monthly accounts may be sent. Future users of premium information may however be asked to identify themselves at gateways established on the network, perhaps by means of a credit card account number. If this does happen there will be a need for much greater security safeguards to protect against fraud.

Another aspect of the usefulness or otherwise of information available from the Internet is the further use to which it might be put and the forms in which it may or may not be further distributed. Much of the information provided is in the public domain and free from any copyright restrictions, although there is frequently an implicit trust that users will not exploit it for commercial purposes without due acknowledgement and payment to the originators. This philosophy has only been successful so far as most users have been in the academic sector. However with increasing interest by the commercial sector and other groups of users, there may be a need for further safeguards to protect the owners of intellectual property.

4.8 User Support

The quality of both printed and on-screen documentation and other user support is frequently cited as being an important factor when evaluating online and CD-ROM products. Once again, the issue is somewhat more complex with regard to the Internet as the network is not the responsibility of any single body. A fairly substantial amount of user support does exist, usually provided voluntarily. This is available over the Internet in various forms, including the access software and associated documentation, guides to the use of the network, files of FAQs and FYIs (For Your Information).

Furthermore, there are various discussion lists to which potential users may post their enquiries.

5. Conclusion

The rapid growth of the Internet over the last few years is already beginning to have an impact upon the lives of everybody working with information. Its importance as an information source is likely to continue to develop at an accelerating rate as new sources become available and new tools for access are introduced. The potential use of the Internet is likely to be the single most important development influencing the work of information professionals over the next decade. Yet the technology is still in its infancy and is unlikely to replace paper-based, and existing electronic information systems in the foreseeable future. A recent editorial in the *Library Journal* discussed this issue and pointed out that "managing [information services during] an indefinite transition period is the real problem".[44] Librarians must therefore come to terms with the networked resources which are available and understand both the advantages and the limitations of this technology, in the same way as they have with other sources of information.

> Instead of waiting for the paperless society, we must work to serve the 'hybrid' society in which we will live out our lives.[44]

As has been demonstrated, one of the core professional skills of the librarian is the ability to make an informed assessment about the sources of information they use and rely upon. This is equally the case with information provided over networks as with printed books or CD-ROM products. There are a large number of evaluative guides and published reviews for traditional printed and electronic sources of information. Hitherto, there has been a lack of such material for networked information sources which would assist in forming such judgements. This paper therefore has endeavoured to discuss some of the issues involved in, and suggested some criteria for evaluating information from the Internet. Due to the innumerable developments in the range of sources, the presentation of information and means of access which are constantly taking place, inevitably this can only be a provisional list. However as the Internet becomes a more widely used and understood reference tool, so the strengths and weaknesses will become more apparent and the process of evaluationwill become more refined.

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35. Newsgroups or Usenet News may be described as a vast array of electronic bulletin boards, each dealing with a different subject matter. Items are posted to the bulletin board where they can be accessed and read by anyone with the relevant software. Newsgroups differ from Electronic Discussion Groups or Listservs, where a user specifically requests to subscribe to a group and any items are mailed to the moderator of the group, who then distributes the material to all members of the discussion group.

36. For example, the Gopher Nursing Service at Warwick University used GopherReport v.2.0 written in PERL by Eric Katz and wwwstat-0.3 by Roy Fielding for analysing server logs to establish the volume of use of the service. Both programs are in the public domain.

37. For example, the WWW FAQ archive is maintained at "rtfm.mit.edu" in "/pub/usenet/news.answers/www/faq" and is posted to the newsgroup "news.answers".

38. WWW sites often have an introductory screen known as a "Home Page" which can serve as a contents guide to the resources of WWW in a particular area.

39. For example, "sci.med" is very broad whereas some of the "sci.med" groups, such as "sci.med.telemedicine" or "sci.med.aids", cover the narrower subject areas implied by their titles

40. An example could be the Warwick University Nursing Information Service (either "Gopher.csv.warwick.ac.uk10001" or "http://www.csv.warwick.ac.uk:8000/"), which could be evaluated as a site as regards its provision of information for nursing. In addition, the service might usefully be compared to a similar site, for example Nightingale (gopher://nightingale.con.utk.edu/1).

41. For example, "The Hancock List", a list of health science resources on the Internet/Bitnet, is available via anonymous FTP from "ftp.sura.net" in the "pub.nic" directory. The name of the file is "medical.resources.xxx" where "xxx" is the date that the file was last updated.

42. The World-Wide Web Worm can be accessed at "http://www.cs.colorado.edu/home/ncbryan/" (select the hyper-link for the Worm).

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Driver Education for the Superhighway : C.A.L. for End Users

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Abstract

The prospects are for mass use of the Internet for information as well as the current communication and entertainment purposes which pose significant problems for current training delivery methods. There are eight important factors relating to the choice of delivery method: getting a quick start using real tasks which use previous knowledge and require the user to think and improvise; significant amounts of feedback are required as is convenience of use and consistency in delivery. Efficiency in development and delivery is also required. Various methods are tested against these

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criteria. The development and testing of a set of computer-aided-learning packages is described. The content to be delivered on Internet use is analysed into five groups: button-pressing, maps, travel guides, detour and exploration tools. These are tested against the suitability of the various delivery methods to assist in selecting the appropriate mix of methods.

Introduction

The superhighway presents the potential for use of information searching skills by the mass of the population much like cars or telephones. The idea of an information superhighway has caught the imagination of such people as the Vice President of the United States, journalists and school children. The breadth of the acquaintance with the concept is indicated by the satirization of the Internet on a recent BBC Radio 4 programme. Universities in the United Kingdom and elsewhere will produce graduates who are Internet-literate people; some schools in the USA are using the Internet already.

The Internet is mainly used for communications and entertainment at present, but this use is likely to broaden to encompass information gathering. The first steps toward placing popular information on the Internet are newspapers such as the Financial Times and the Guardian in the United Kingdom being made available. There are a number of databases and information sources already available for those who wish to pay.

Information use in academia may become more common and even expected through the expansion of the number of information sources available and free at the point of use. A number of article delivery services which are useful to academic staff use the Internet to reveal, and occasionally deliver, the documents containing the information. These services have relatively complex structures and less than obvious means of operation.

Even if we limit our attention to students of our universities, we are contemplating a quantum leap in the provision of training for information handling skills, whether on the Internet or in other spheres. An example of the scale of the training load which we must contemplate comes from my own University where the plan is to provide every new student with information technology skills within three years. This will require the provision of a twenty-hour course to at least 4,500 students each year. If student and tutor contact is provided in the usual way, 20 tutors will be required.

Considerations in Training for a Mass Market

This scale of education and training requires consideration to be given to the efficiency, consistency, adaptability and effectiveness of our educational efforts. The effectiveness of training concerns the style, delivery and content for instruction of a mass market.

The instruction style must take into account the fact that adults are being educated. These are people who have or will have access to the Internet and want results quickly. Thus they learn by immediate use and then experimenting to find additional techniques for immediate needs; their learning is not planed nor does it follow logical systematic instruction steps. Learners attempt to transfer knowledge from superficially similar situations, such as electronic games; and they are often poor in recognising and diagnosing faults.

The "facts" of learning are that people learn by doing, by thinking and reasoning about the hypotheses generated, by working toward their own goals, by attempting to use prior knowledge to assimilate new experiences, and by using error diagnosis and recovery to discover the boundaries of their knowledge.[1]

This analysis of the effective style of education required for adult active learners combined with the need for efficiency leads toward the five principles of minimalist instruction as set out by J.M. Carroll.[1]

1. Get the learner started quickly on activities which will provide them with usable skills.
2. Rely on the learner to think and improvise through guided use of the learner's ability to infer.
3. Direct the learning at real tasks, not theory.
4. Exploit what people already know, using analogies and familiar models.

5. Support error recognition and recovery, through feedback to the users on their actions.

These principles represent the effectiveness and adaptability tests which need to be applied to instruction of large numbers of people. To these need to be added the issues of efficiency, and consistency of quality. Since we are looking at the applicability of instruction to a mass of users, the convenience of the instruction to the learner is important. This is most easily encapsulated as whether the learner must come to the instructor, or can use the instructions at their own location. A group of tests made up of the minimalist instruction principles, consistency of delivery, efficiency of delivery and convenience to the learner can be used to look at the methods of instruction delivery.

Delivery Methods

The methods of delivering instruction which are in common use are print, one-to-one, seminars, demonstrations, workshops, and video. These methods should be tested against a combination of the minimalist training principles, and efficiency, consistency and convenience to determine which are the appropriate ones.

Printed materials such as manuals, user guides, handbooks, and guides are the most common means of delivering instruction to users remote from the source of instruction. They are efficient, convenient and consistent, but do not fulfil any of the five principles of minimalist instruction except that of using previous knowledge. An important advantage of printed materials used to supplement all other delivery methods is the improvement in effectiveness achieved by having material for later reference.

One-to-one instruction gets the learner started quickly, directs the efforts at real tasks, and may exploit what people already know. However it normally provides little feedback, and less opportunity for the learner to improvise. More importantly consistency is variable due to the abilities of the teacher and the time available, and is very expensive. The convenience of the user can only be met by the instructor travelling to the learner, making such delivery even less efficient.

Seminars and courses whether of a few hours or a number of sessions exploit what people already know, but meet very little of the other minimalist tests. There is some difficulty with consistency due to instructors, time available and numbers of learners. These are more efficient than one-to-one methods, but remain expensive as exemplified by the University of Glasgow requirement to train 4,500 students requiring about 20 instructors using the traditional seminar format.

Demonstrations of sources can be taken to groups of people and do rely on previous knowledge of the users, and use their abilities to think and improvise and provide feedback to some extent. These are as efficient as seminars, meet some additional minimalist criteria, and are improved by supporting printed materials.

Workshops get the learner started relatively quickly (in the workshop if not always in user terms), direct the learning to more real tasks, exploit what people already know, support feedback, rely upon the learner to think and improvise. Consistency, efficiency and location remain problems. Consistency is as difficult to maintain in workshops as in seminars and demonstrations, indeed, as the number of instructors in a workshop rise, the possibility for variability of the instruction also increases. In some cases the workshops can be presented using departmental microcomputer clusters, but many times central clusters have to be used, thus reducing convenience.

The efficiency of the workshop approach has a limit to its efficiency if it is to maintain its effectiveness (defined mainly by the tasks, quick start, improvisation, and feedback) which affect seminars and demonstrations less. As the numbers rise above, say eight learners, so must the number of instructors. For example, Diaz and Von Ville[2] describe the effectiveness and popularity of a workshop approach at Ohio State University which led to one case of 50 people arriving for the session. The effectiveness of a workshop of that size cannot be as great as smaller workshops, unless more instructors are added.

Video presentations can overcome the difficulties of location by the ability of the learner to use the instruction at their convenience. Although the video does provide consistent (but low) quality and relies on previous knowledge, it suffers all the disadvantages of print, and is much more expensive to provide. Video presentations can be used in conjunction with other methods of delivery to improve them.

Table 1: Performance of Delivery Methods against Tests

	Print	One-to-One	Seminars	Demos	Workshops	Videos	CAL
Quick start		x			x		x
Think & improvise				x	x		x
Real tasks		x			x		x
Existing knowledge	x	?	x	x	?	x	x
Feedback		?		?	x		x
Convenience	x	?		?	?	x	x
Consistency	x			?	?	x	x
Efficiency	x		?	?	??	?	?

Computer Aided Learning (CAL) is not yet a common method of instruction delivery, largely because of its development costs. This should be reconsidered in the light of the mass market to be served and its capabilities to meet the tests established for this context. CAL can meet the minimalist instruction principles of an early start for the user, on real tasks, relying on their ability to think and improvise, exploiting what people already know and give feedback (simulated or through real connections). CAL packages can deliver the instruction in a consistent manner at the user's terminal. Printed material provides additional support and adaptability for many users. The cost of these CAL packages, if appropriately designed need not be so expensive as sometimes thought because of their wide applicability.

A Demonstrator Set of CAL Packages

Consideration of these issues of training large numbers of students led toward successful application with other parts of the University for a development grant under the Teaching and Learning Technologies Programme (TLTP). This programme allocated £22.5 million over three years to fund the development of material and practices to spread the use of teaching technology throughout higher education in the United Kingdom. The initial grants were issued to 43 projects, most of which were consortia.

The University of Glasgow received one of the few institutional grants for its Teaching with Independent Learning Technologies (TILT). This project aims to develop the use of independent learning technologies throughout the university, by widespread use of cost-effective educational technology to assist in making students more independent learners. The University Library is one of 19 partner departments in TILT arranged into 5 subgroups dealing with numeracy, statistical and modelling skills, text handling skills, multimedia education techniques, and evaluation of the products and practices.

The objective of the Library is to develop CAL packages to assist undergraduate students in developing information handling skills for independent use or within a class. It is a part of the condition of the grant that products are made available to other UK universities, so the packages are generic, making them applicable to many subjects and institutional settings. A developer has been employed to prepare the packages, and co-operation with Robert Gordon University in Aberdeen had further assisted developments.[4]

Investigations at the start of the project showed that CAL and hypermedia for the teaching of information skills were in their very early stages. Most hypermedia applications were as guides to single libraries, the major exception was the doctoral work being done by Joan Williams at Robert Gordon University. An additional difficulty proved to be that much of the work was aimed at trainers, and those which were not, tended toward the "electronic book", rather a method with its own possibilities.

Four packages have been developed to date designed to demonstrate the applicability and effectiveness of CAL to information handling skills. These are

- *Biological Abstracts* tutorial
- How to Choose Books and Journals
- Library Search Skills, and
- Database Search Techniques.

The *Biological Abstracts* tutorial is a simple one demonstrating the applicability of such packages to learning the elements of using a specific information source. This package is mounted on the machine which runs the *Biological Abstracts* CD-ROM and enables a search to be run from within the package. This package requires about 20 minutes for a student to complete and required about two months to develop.

"How to Choose Books and Journals" is a second package which addresses the selection and evaluation of materials for their usefulness for the required purpose. This, therefore, deals with skills rather than facts and poses some problems in assessing the skills. This package is in four sections each headed by a question: Why should I read it?, Is it appropriate?, What does it tell me? and How is the information presented? Extensive use of graphics, examples, hidden text, and exercises are used to develop the learners' skills. This package required four months to develop and test, and showed positive results in February 1994 tests with first year undergraduates.

"Library Search Skills" was developed in conjunction with Joan Robertson and Dr. Dorothy Williams of Robert Gordon University to deal with analysis of essay and project assignments and the whole information search strategy. The whole package is divided into five modules which can be used independently or in user-selected orders in about 45 minutes. They are: Defining unfamiliar terms, Highlighting keywords, Broad and narrow terms, Synonyms and related terms, The complete search strategy. Each section contains a short introduction followed by numerous examples and exercises in a semi-structured format to allow linear progression or a browsing approach.[4]

The "Database Search Techniques" package deals with the principles of using electronic sources rather than the details of specific databases, although examples have been used to illustrate the different types available. The package simulates a simple database allowing the user to type directly into "fields" on the screen, and use the keyboard and mouse to gain skills and experience. The package is structured around the analogy of a treasure hunt using appropriate graphics to maintain the user's interest.

The Database package, which requires about half an hour to complete, has three main sections on basic principles, advanced methods, and practical exercises. Each section is divided into smaller portions, for example, the Basic Principles section is divided into five: What are computer sources?, Finding the right stating point, Plan your route, Your goal is in sight!, How to take home the prize. The advanced methods section covers advanced Boolean, controlled vocabularies, citation searching, and a group of helpful hints.

All these packages are composed of a series of modules so the learner can select those of interest in any order, although a sequential approach is encouraged. Each module is interactive in that most screens require some action by the user, by requiring the learner to make decisions and choices to which responses are provided encouraging and suggesting alternative choices. Early work showed the importance of graphics and reduction in the amount of text shown on the screen at any one time. This principle has been followed throughout, by having a simple, uncluttered layout with navigation buttons at the bottom of the screen allowing the user to move about the package at their choice.

Evaluation of these packages has followed the normal route of prototyping with library and academic staff, and students, using their comments to improve the presentation. The completed packages have also been evaluated with the reviewers at Ulster, Durham, Newcastle and Sheffield universities giving enthusiastic responses. Testing of packages has been done with small groups to determine learning gains resulting from the use of the packages.

The main test of the packages has been with a large group of students who were on a pre-university Summer school. It has proved difficult to introduce students adequately to the library search skills which this group of one hundred to two hundred need for the start of their university education. The efforts in the past have centred on a lecture followed by an exercise. These exercises deal with use of the library catalogue, finding the way around the library, and five information searches. Although the instruction has given assistance to the students, it has never been wholly successful, partly because of the numbers involved.

In the Summer of 1994 the 137 pre-university students were given an introductory lecture on study and library skills in the morning to ensure all students had similar information compared to previous years and sufficient information to attempt the exercises. After lunch the students were divided into two groups. One group used the CAL packages on How to Use Books and Journals and on Library Search Skills before the exercises. The other group conducted the exercise (as in past years) before the CAL (but also used the CAL packages later).

The results of the information search exercises showed a significant difference between those who used and those who did not use the CAL packages. Comparison of Group 1, who completed the exercise before the use of the CAL packages, and Group 2 who used the CAL before the exercises is over five questions. These related to opening hours of an art gallery, a word definition, an address, the location of a postal code, and the ownership of a group of businesses. The answers to these questions were characterised by being wholly correct; incomplete, **with** book and call number information; incomplete **without** book and call number information; and wrong.

Table 2: Information Search Exercise Results

	% correct	% incomplete (+)	% incomplete (-)	% wrong
Question 1				
Group 1 (no CAL)	23	13	19	7
Group 2 (CAL)	37	16	9	5
Question 2				
Group 1 (no CAL)	12	20	9	3
Group 2 (CAL)	25	22	15	3
Question 3				
Group 1 (no CAL)	7	8	12	0
Group 2 (CAL)	23	15	8	7
Question 4				
Group 1 (no CAL)	7	5	3	0
Group 2 (CAL)	20	11	7	8
Question 5				
Group 1 (no CAL)	9	12	4	3
Group 2 (CAL)	8	7	8	1

The results of this CAL development project are attractive, easy to use modules incorporating the principles of

- a rapid start,
- reliance on user inferences,
- exploitation of what the users already know,
- provision of feedback for error recognition and recovery,
- frequent provision of direct learning at the user's real tasks.

In addition, the users can make use of the package at their convenience, effective learning is provided, and considering the number of students concerned the development costs are small.

Content

The current experience with the instruction of users of multiple information systems comes from the efforts to introduce users to CD-ROM databases. The instructions given on the use of OPACs has not translated well to the databases available on CD. This should not have been a surprise to trainers, as the use of OPACs seems to remain mainly to search for known items. At

Glasgow University Library, for example the proportion of subject searches remains very low, currently ranging from 8% to 12% of the OPAC transactions. The use of CD-ROM and Internet databases however, is proving to be mainly for unknown sources. The other new element of training for CD-ROM databases is the need to teach the operation of a variety of communication channels and sources. These elements of the CD-ROM situation are merely a microcosm of the mass use of the Internet for information searching.

The general kind of content which users need relates to the variety of situations experienced in using the Internet. A detailed description of content is not of interest here, beyond merely indicating the range of skills and information which people need to have to use the Internet fully. The kinds of information required are:

- button pressing - how this equipment or source is made to work.

  Various navigational aids:
- maps indicating common routes to known sources;
- travel guides to indicate the value of what's there;
- detour tools - concepts to assist in dealing with broken bridges, washed out roads, detours and by-passes, and breakdown recovery;
- exploration tools - concepts enabling the driver or navigator to become an explorer.

No one delivery method can meet all these needs, but some are better than others for delivery of these five types of information. Comparing the content **(Table 3)** and the delivery methods **(Table 1)** can help to select the appropriate mix of instruction channels. For example, there are a number of methods which are suitable for the delivery of the "button-pressing" content, but print remains the best for both "maps" and "travel guides". Consideration of the best delivery method is essential, but it must be modified by the considerations of efficiency, convenience and the minimalist training principles to give the most appropriate combination for the circumstances. As the circumstances being considered here are for large numbers of people at sites remote from the library to equip them with skills to search for information through the electronic networks, print and computer aided learning meet most of the criteria. So a combination of these should meet many of the requirements for the training of large numbers of people who may be remote from the trainers or library.

Table 3: Suitability of Delivery Method for Types of Content

	Button-pressing	Maps	Travel guides	Detour tools	Exploration tools
Print	x	x	x		
One-to-one	x			x	?
Seminars	?		?		
Demonstrations	x			x	?
Workshops	x			x	x
Video	?			?	
CAL	x		?	x	x

Conclusion

The work done in the TILT project shows that CAL packages can be the most effective, efficient, adaptable and convenient delivery method in circumstances where large numbers of people require the instruction. CAL packages are also very useful in delivering operational and conceptual skills relating to information search on the Internet.

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Development of Slides about Information Retrieval, Using a Presentation Software Package

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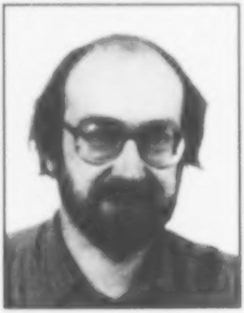

Since 1983, Paul Nieuwenhuysen is on the academic staff of the Vrije Universiteit Brussel (V.U.B.). Currently, he is head of the information and documentation department, as well as science and technology librarian at the University Library, and is responsible for a course on online information retrieval. At the Universitaire Instelling Antwerpen (U.I.A.), in the inter-university postgraduate programme in information and library science he is responsible for courses on information technology and on the information market, and in the Communication Studies programme he teaches a course on electronic networks. He serves on editorial boards of several journals in the area of information science, and has been a consultant for various agencies, including UNESCO-PGI, UNESCO-IHP, UNESCO-MAB and UNDP.

Abstract

The author reports on his experience with the creation of slides, using a presentation software package on microcomputer, in the subject area of information retrieval. The language used in the presentations is English, to make the slides potentially useful on an international scale. Hundreds of slides were developed to support various courses at the universities of Brussels and Antwerp in Belgium, lectures at conferences as well as professional training sessions, in Belgium and abroad.

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The files of "slides" in computer-readable format form the basis for output in several formats: hard-copy black-and-white or colour transparencies, printouts on paper, direct projections from a microcomputer using for instance an LCD overhead projector, and more personal on screen slide shows on a microcomputer using the display monitor.

Some colleagues may be interested in making more use of presentation software in their own context, and some may learn from tips offered on the development of this material.

Aims of "Slides" on Computer and of Presentation Software

Generally, "slides" on computer can support lectures. Presentation software is applied to create series of slides.

In this case, I have created hundreds of "slides" in English, to support:

- lectures at conferences and professional training sessions, in various countries, and
- courses on information retrieval and networks, at the universities of Brussels and Antwerp in Belgium. (In particular, for third-year students in Communications Studies at the Vrije Universiteit Brussel, I teach a compulsory course about on-line information retrieval. The official name of the course in Dutch is "On-line opzoeking van documentaire informatie". This is taught since the academic year 1989-'90. The course is optional for students in the inter-university specialised postgraduate study in archive science at the V.U.B. The course consists of 30 hours teaching and 15 hours practical exercises. Each year, more than 100 students take the course. More information about this and other educational frameworks in which the slides are used can be read elsewhere.[1]

Various Output Formats of a Presentation File on Computer

Each file of "slides" in computer-readable format forms the basis for output in several formats, as outlined in **Table 1**.

Output produced from the "slides" in computer readable form	**Equipment and materials typically used for the production**	**Equipment used during application of the presentation**	**Type of application**
Black and white transparencies	Black and white laser printer and transparencies suitable for laser printers (or photocopying machines) Inkjet printer and transparencies suitable for inkjet printers (These types of transparencies are different.)	An overhead projector, which must be less powerful than in the case of direct projection from the computer	Projection during presentation
Colour transparencies	Colour inkjet printer and transparencies suitable for inkjet printers		
Black and white print outs of 1, 2, 3, 4, 6 slides per page	Black and white laser printer (or inkjet printer) Photocopier	n/a	Hand-outs Printed syllabus with 2 slides per page
Colour printouts of 1, 2, 3, 4, 6 slides per page	Colour inkjet printer, and paper suitable for inkjet printers	n/a	Hand-outs
35 mm colour slides	Service bureau or in house use of specialised equipment (computer + software + slide production equipment)	35 mm slide projector	Projection during presentation
On-screen show	n/a	A powerful computer with VGA or better and with Windows	Individual use or use for a group of only a few persons
Projection directly from a computer	n/a	Preferably a powerful notebook microcomputer with VGA or better and with Windows, and an LCD overhead projection panel for VGA or better plus a powerful overhead projector, or even better a video projector	Projection during presentation

Table 1: Various outputs from a presentation file on computer

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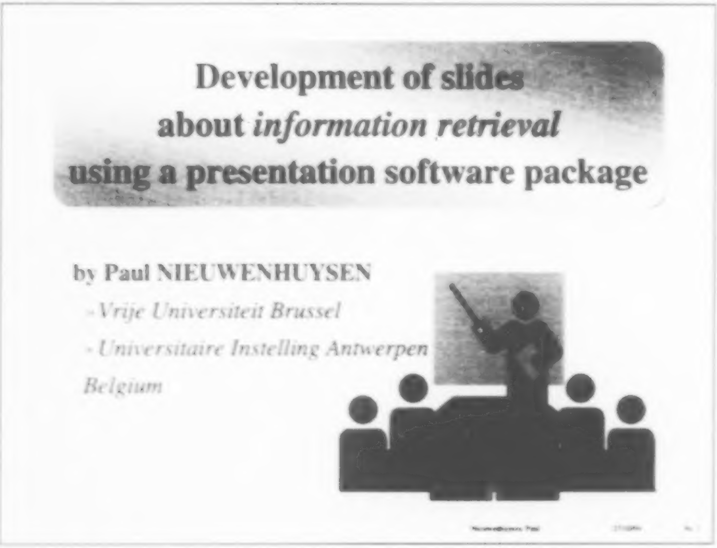
So all output formats have their advantages and disadvantages. For instance:

- The 35mm slides offer high resolution but they are expensive.
- Projections directly from the computer are cheap, but the computer must be rather fast in the case of complicated slides, and the most widespread types of overhead projectors used for transparencies are not powerful enough.

To obtain optimal output, for each "slide" format, a presentation template was developed, including for instance a suitable colour scheme. Some examples:

- For colour transparencies, black characters without shadow are chosen on the natural transparent background, plus occasional use of light colours, which yields good contrast and saves ink; slides are automatically numbered and dated (**Figure 1 A**).



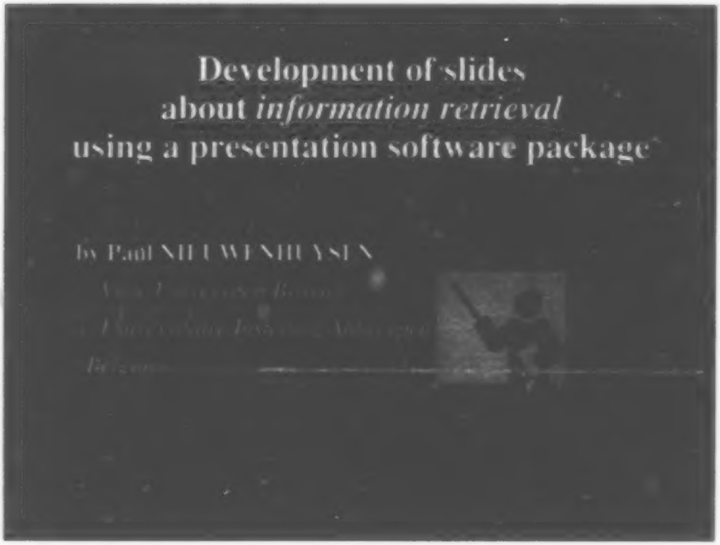
Development of slides
about *information retrieval*
using a presentation software package

by Paul NIEUWENHUYSEN
- Vrije Universiteit Brussel
- Universitaire Instelling Antwerpen
Belgium

Figure 1 A

- For an on screen show with a good monitor and for 35 mm slides, white characters are chosen with grey shadows, on a filled, dark and shaded blue background, plus occasional use of dark colours, which yields a more spectacular result than the transparencies, but which is not so suitable for output on paper; slide number and date is less useful here (on the contrary it would be disturbing information on the screen) and therefore it is not applied in this template (**Figure 1 B**).

As an illustration, the first slide from the computer presentation of this paper in the form of a conference lecture, is included here in printed output formats, based on the format templates mentioned here (**Figure 1 A-B**).



Development of slides
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Figure 1 B

Subjects Treated in the Produced Presentations

Switching here from the medium to the message, **Figure 2** outlines the contents of the presentations and some of the relations.

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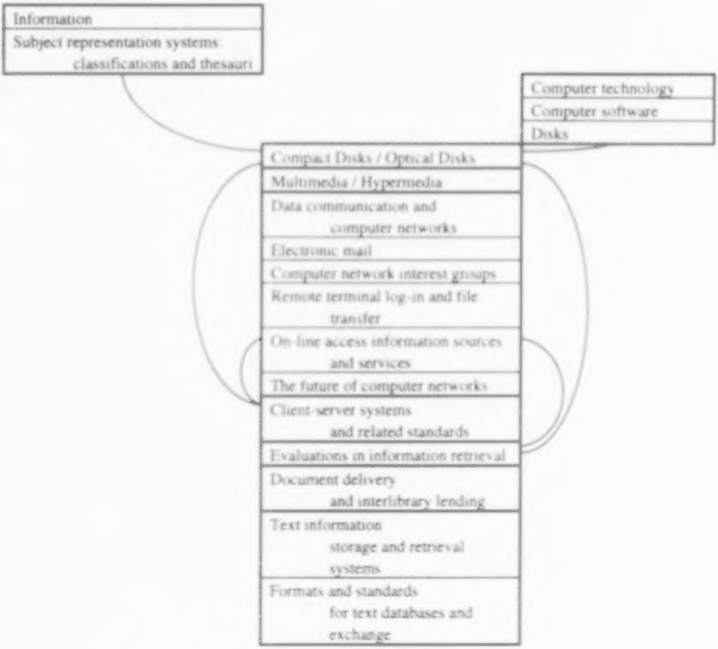

Information
Subject representation systems: classifications and thesauri
Computer technology
Computer software
Disks
Compact Disks / Optical Disks
Multimedia / Hypermedia
Data communication and computer networks
Electronic mail
Computer network interest groups
Remote terminal log-in and file transfer
On-line access information sources and services
The future of computer networks
Client-server systems and related standards
Evaluations in information retrieval
Document delivery and interlibrary lending
Text information storage and retrieval systems
Formats and standards for text databases and exchange

Figure 2: The contents of the presentations and some of the relations

"The Medium is the Message"

This is the well-known concentration in a few words of McLuhan's ideas, including that the influence of the medium on the contents of the message should not be underestimated. Here this can be translated to "the slides are the lecture". And indeed we should realise the danger that a series of slides cannot accommodate all the important material to be communicated. For instance:

- Live demonstrations and practical work are still required besides the presentation with slides.
- More detailed material (texts, lists, bibliographies, software) should be provided separately.

Which Presentation Software Package to Choose and Use?

Many similar and suitable packages are commercially available nowadays. The subsequent versions offer higher quality, more features, and greater complexity.

For my own work, I have been using various notebook microcomputers with Intel microprocessors during recent years, and all the subsequent versions of the presentation package Microsoft Powerpoint, now in version 4.0 embedded in DOS 6 and Windows 3.1. Some reasons for this choice are given below:

Powerpoint is

- one of the pioneering, first presentation packages that were available for Windows.
- probably the market leader now, the most widely used presentation program.
- highly appreciated in all the individual as well as comparative reviews which I have read up to now (for instance [2], [3], [4]).
- well integrated with the package for word processing of the same producer, Microsoft Word (in particular for the editing of a text and for the creation of a table to be inserted in a Powerpoint presentation).
- very similar to Word in its user interface, although I have used the flexibility of their interfaces to make them even more look alike.
- designed to use the same graphing program as the packages for word processing, Word, and for spreadsheets, Excel, of the same company, which increases integration and compatibility and saves time to learn the program as well as some space on the hard disk of the computer.
- compatible with Apple systems in the sense that presentations created using a PC with DOS and Windows can also be run on Apple systems, without tedious conversion.
- affordable when purchased as part of Microsoft's Office bundle.

- further developed by a stable, successful company, as evidenced by the appearance of subsequent versions (2, 3, and 4 up to now),
- well documented by the extensive help program built in, by the less extensive printed manual, and by several books by the producer Microsoft (for instance [5], [6]) and by other publishers (for instance [7]).

Tips for Improving Slides and Presentations

Unfortunately, the application of powerful presentation software does not guarantee an attractive and clear presentation. The following are what I consider as good and important tips for the successful development of slides and presentations. Most of the tips fall in the category "keep it simple".

- Keep texts short.
- Try to make character sizes at least 24 points, so that the people in the back of the room can also read your message.
- Thick, bold text is better readable than normal text when only a few words and lines are shown, such as in newspaper headings. This is certainly so in the case of light characters or lines on a dark background.
- Use less than 10 lines of texts on a slide, because people hate reading and listening at the same time.
- Use bullets to start each item in a text list.
- Use only 2 or at maximum 3 levels of headings per slide.
- Use only 1 or at maximum 2 fonts per slide.
- Make the title stand out clearly from the body text lines.
- Use small tables whenever possible, for instance when comparing systems. Avoid detailed, big tables with small characters and numbers, because nobody will be able to decipher them.
- Use flow charts, figures or schemes instead of text whenever possible.
- Instead of text, try to use pictograms such as happy and sad faces, to represent advantages and disadvantages of systems.
- Use a well suited type of chart to show the data. For instance, use pie charts to show proportion, such as market share, and make a good choice between line and bar charts to represent a change over time.
- Foreground and background colours need high contrast for visibility.
- Avoid unnecessary frames on the slide, because the slide's border

already serves as a frame for your message; furthermore, using an overhead projector with unframed transparencies causes in some cases an additional frame of white light around the projection of the transparency.

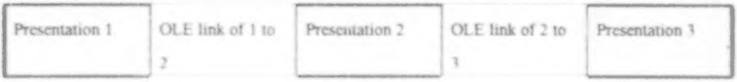
- Use fancy transitions and builds for automatic screen shows, but not during lectures.
- Use a fast, powerful computer for development as well as for the presentations, because building slides full-screen is a power-hungry process. A slow computer may make your audience impatiently waiting for the next slide. Elaborated transition effects worsen this problem, and therefore should be left out most of the time.

Linking Presentations together to Form a Course

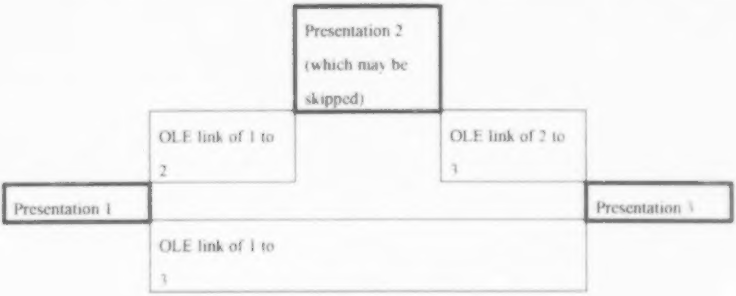
Presentations in the form of computer files are linked together to form a course.

The method used here is the general technique applied in many programs developed to run in Microsoft Windows 3.1, named "object linking and embedding" or OLE.

A simple linear order, that is a simple sequence, is preferred at least up to now and has normally been created:



Branching is also possible to go into the direction of hypermedia, but then the simple relation with the printed course material derived from the presentation file would turn into a more complex one which may not be so clear anymore to students and other users. However, branching was found to be useful to skip topics that are suitable for one group of students who get a detailed course, when the slides are presented to another group getting a less detailed overview.



Appreciation of the Presentations by the Audience

I ask each student to send at least one message to me by electronic mail with one or several suggestions on how to improve the course and the materials. Most students are pleased with the use of slides. Of course some students ask for a detailed course text besides the slides (so that they do not have to attend the courses?). Some Dutch-speaking students would prefer slides in Dutch.

Many students, and in particular those in communications studies, learn not only the contents, but they are happy to discover the presentations as a communication medium.

Related Work and Products

A short slide presentation with handout-texts on the topic of computer networks has been made available as a file in the Internet; the developers of this product have also used Powerpoint.[8] Retrieving this computer presentation was easy. The slides are similar to the ones created by myself. Some ideas were useful. The scope of the presentation is much more limited however.

A chapter of an instructional handbook about the Internet contains small printouts of slides[9]. I have not yet had the opportunity to have a look at this recent work, as it has just arrived in our library.

Computer assisted learning, hypertext or hypermedia are now used more and more to present information, covering also the subject of information retrieval and networks (see for instance [10], [11]) However, this kind of material is not directly useful to support lectures in a classroom. The bibliography which I try to keep up to date for the students refers to some of these items.

Conclusions

Generally stated and as you will expect by now, in my opinion, computer presentations are "OK". More concretely:

- Slides can add value to courses and lectures.
- Computer slides are cheaper than slides in any hard copy format.
- Presentations form the basis for several output products.
- Computer slides are easier to manage than hard copy slides, certainly when their number increases to a few hundreds as in this case.

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8. The following is an excerpt of the announcement by Margaret Isaacs, NISP/ITTI Network Training Materials Project, Computing Service, University of Newcastle-upon-Tyne, Newcastle-upon-Tyne NE1 7RU. E-mail: Margaret.Isaacs@uk.ac.ncl Phone: (091) 222 8069 Fax: (091) 222 8765: The Network Training Materials Gopher.

This is an experimental gopher server set up to promote and encourage network training. Trainmat is an initiative of the UK Network Training Materials Project, a joint enterprise of NISP (Networked Information Services Project) and ITTI (Information Technology Training Initiative), based at the University of Newcastle upon Tyne, UK. Through the trainmat gopher, the Network Training Materials Project aims to make it easy for trainers to access a range of network training materials which they may then use as models, or which they may adapt for their own training programmes. End-users may also find much of the material of interest. The primary training materials being made available on this gopher are those produced by the Network Training Materials Project in its Network Training Pack. (Unit 1 is there now, Unit 2 soon will be.) However, other training materials and supporting material have also been brought under this one gopher umbrella, and it is hoped that many more items will be added in the course of time. Point your gopher client to: trainmat.ncl.ac.uk

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    You may obtain a copy of IPWIN.ZIP from these locations:

    - via gopher: point your client to: fenwick.gmu.edu, port 70 Computers Info-Technology/Software under Software available on this Gopher
    - via anonymous ftp using the URL file://ftp.gmu.edu/library

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Collection Development in the Large American Research Library : At an End or at a Beginning?

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Abstract

Research libraries and their funding institutions of all sizes and in all geographical areas have experienced continuing financial difficulties in the last two decades. While the term "crisis" is overused in public discourse, the mass media, and in everyday language, the manner in which we provide published scholarship and information for scholarship in research libraries constitutes a "crisis", if that term denotes an undesirable outcome or injurious trend line. This crisis has emerged in the United States in such a way as to bring into question the character and cost of research libraries in general, and the scholarly communication process itself.

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This paper examines the relations among the technological, economic, and socio-cultural conditions which have contributed to the "crisis". It also examines the "crisis" from the perspective of technological change in the creation and dissemination of information for scholarship, and the emergence of the so-called "both / and" dilemma - that is, the difficult task deploying static or declining human, material, and financial resources in order to serve research and instructional purposes in conventional print and electronic environments. An analysis of the what it means to be a comprehensive research library predicated upon specialization of staff by subject, area, or language education and experience in an environment where rhetorical claims and real innovation compete, is carried out.

The paper concludes with cautious recommendations on what a large research library should look like in the next decade, both in terms of its collections and access to information, and what the research librarian's craft should be.

Introduction

Let me begin by saying that my academic training inclines me towards the construction of too-easy dichotomies as in the title of my paper - "Collection Development in the Large American Research Library : At an End or at a Beginning?" As a former teacher and student of political science and still Curator of the Social Sciences at my institution, dichotomies or reductionism to pairs has always been an intellectual predisposition.

What has always gotten in the way of the neatness of classification and reductionism from the Many to the Few, if rarely to the One, has been the sheer messiness of our lived-lives. As a further example of what I mean, as is probably felt by many of us, we appear to be living in the midst of a World Historical Event - that is, the break-up of a stable bipolarity in the world and European state system, which seemed as late as 1990 to have an indefinite, if not infinite, future. Because of its apparent stability factually, it helped condition the perceptions, descriptions, explanations, classifications, and predictions of most social scientists and observers who deal with international relations.

Anecdotally, sitting with colleagues from the departments of political science, economics, sociology, law, and history, in a faculty seminar on the meaning and coming impact of Europe 1992. I recall looking over to a friend and well-known international relations scholar, Stephen Krasner, and saying "So much for the predictive value of social science!". This referred to the relative great surprise at the speed and nature of the disintegration of the former Soviet bloc best symbolized for many by the destruction of the "Concrete Curtain" known as the Berlin Wall. For some, like myself, who had been a Cold Warrior in military intelligence in Berlin between 1959-1962, the destruction of the Wall was an emotional as well as intellectual event. In its wake, we have seen a time where certain events clearly symbolize the messiness of the post-bipolar era such as the prima facie absurd application of Russia for membership in NATO, if not the continued existence of NATO itself.

Large Research Libraries and Apparent Stability

The term "apparent stability" was used above to describe the perception of the world and European state system before there arose a scramble for ex post facto rationalization and a search for new explanatory structures in a world of unsightly postmodern debunking and fashionable relativism as well as a healthier revival of skepticism about all theory and Grand Narratives.

The world of large U.S. research libraries comprises 22 libraries - 9 private, 13 public. We operationally define these Large Research Libraries (LRLs hereafter) using an "Index Naive" composed of 5 elements:

- 3 million or more volumes,
- 100,000 or more volumes; added per annum over last 5 years,
- a materials budget of $5 million or more,
- 30,000 or more active serials, and
- a combination of a minimum of 3 full-time selectors included in a cadre of 25 or more selectors.

[Note: each of the first 4 elements is derived from ARL statistics; hence, given the troubled validity and reliability of such statistics, the use of the term "naive". The fifth element is based on an informal survey of 12 of the 22 institutions qualified by the first 4 elements]

These LRLs, and most research libraries of all sizes, lived in a world of apparent, if diminishing, stability between 1961-1990, though like the bipolar frame of reference, it depended in large part on a combination of technological means and assumptions, political, economic, and cultural values and beliefs. Vastly oversimplified in terms of political, economic, and cultural factors, the system depended on:

1. political will (of governments on the one hand and on university administrations and, for public institutions, political assemblies, on the other),
2. economic viability (of the command economy system vs. market-based mixed economies on the one hand, and the workings of the marketplace for products of scholarly communications and the continued availability of funds, on the other), and
3. cultural beliefs and practices (on the one hand, in the bipolar instance, the belief with sustaining state practices reinforcing that belief, that there was really no alternative to that which is or was; in libraries, that the largest relevant reservoir of diverse print resources supplemented by technology-in-service-of-the-book could or should continue.)[1]

Also, this was reinforced by the perception that the sociology of rewards and deprivations in the Academy would continue in its present form with research the dominant partner of teaching and community work within the university, and the dominant form of research evaluation being publication. In part, the LRL then became the repository for the archival units of research of the divisions of knowledge, which, in turn, could or should be relevant to other researchers and students.

Finally, this system placed the library directly in a seemingly stable and even unchangeable model of scholarly communication based on a quartet of author-publisher-library-reader[2] which could be understood either as a closed linear model with no necessary connection between the elements other than that to the left or right, or as a feedback loop system where, for example, readers as students or researchers by virtue of the system engaged in applied focused research or were more generally provoked in terms of imagination and generative research who then became authors themselves onto themselves and critics of those authors who had come before.

The Crises

It is this interplay between technology, economics, and culture punctuated by periodic crises, most often economic in the first instance, to which we will now turn. It is also the actual interaction of technology and resources for research, teaching and learning in large research libraries as well as the scholarly communications process about large research libraries where people such as F.W. Lancaster and Herbert White have played significant roles as critics, analysts, forecasters, and teachers.[3]

The term "crisis" suffers from considerable overuse in our public discourse, mass media, and in our everyday language; so much so, that it is only with due caution that one uses the term. The OED refers to the term's origins in pathology as a turning point of a disease for better or worse or, alternatively, toward recovery or death. While disease and death are suggestive metaphorical devices for conveying intensity and meaning, we prefer somewhat more dispassionate language to indicate what ails us.

The Economic Crisis. The economic crisis is familiar to all of us and from Lancaster and Charles Osburn[4] in the 1970s to the ARL study on University Librarians and Scholarly Communication of 1993, the phenomenon has been predicted, described, and explained. Perhaps, Lancaster's famous aphorism of 1978 where he poses the question "Whither libraries or wither libraries" was and still is the single most provocative way of asking about the future of large research libraries, once the "heart of the university" architecturally and intellectually and still the "laboratory" for most humanists, but to others just a "pulp paper storehouse" at exorbitant cost.

Lancaster, we recall, held that the system of scientific and technical (hereafter ST or STM when the medical literature is included) publication predicated on print media, especially the commercially produced journal, was obsolete and counterproductive fiscally. Either the cultural and economic wellsprings of ST information creation and dissemination would change or research libraries would wither away in breadth and depth.[5] In 1994, after 15 years of nearly perfect demand inelasticity, Lancaster's article remains salient.

Three statistics among many indicate what Lancaster meant and what LRLs have experienced: 1986-1991, ARL serials held decline by 2%, while expenditures increase 70%; ARL monographs fell by 15% while expenditures rose 25%; and, over a 15 year period, 1976-1991, the share of materials or "book budget" expenditures for serials rose from 44.2% to 59.2%.

At Stanford and other LRLs, again to describe the familiar, funds allocated to purchase subscriptions for STM were increasingly insufficient to support either established numbers of journals or to subscribe to new journals. In turn, this has been directly related to a decline in monographic purchases because of increased unit costs and de facto shifts of monographic funds for progressively smaller journal subscription "cores". Also, this pressure from STM has had an effect on funding for Humanities, Social Sciences, and Interdisciplinary Studies as increasing amounts of total materials budget dollars have had to be diverted to sustain STM journal cores. Finally, this had occurred most often within a historical context of continuing support for purchasing power for library materials by university administrations. Hence, again at the all-too-familiar level, the economic crisis, while not limited to STM emerges as an undesirable outcome or injurious trend line.

There are a number of initiatives underway at the regional, national, and international levels directed at changing the model of research product dissemination in STM and other areas, including various digital library initiatives by the Library of Congress and those funded by NSF and DARPA, among others, and explorations by commercial publishers such as Elsevier, Pergamon, and Springer. Because LRLs are committed to breadth and depth in resource accession in STM and because use studies indicate that commercial journals are used, albeit less than society journals, their cost-per-use in aggregate terms indicates they are of value to our faculty and students.

At Stanford, internally, we seek by rigorous faculty liaison, use studies, and citation analysis (what do Stanford faculty cite, where are they cited, what do their doctoral students cite) to keep the 10,000 or so STM titles stable. Externally, as a matter of policy, Stanford and other LRLs are moving on 4 fronts:

- seeking partnerships with commercial and society publishers for the creation of affordable vehicles, electronic or print, for research dissemination;
- exploring the receipt of electronic journals, at the low end, and, working with learned societies, seeking to create, disseminate, and archive core journals without regard to the commercial sector, and, with university presses, seeking to create and disseminate not only electronic journals, but the "enhanced book";
- exploring and bringing into production the creation, dissemination and archiving of "gray literature" domains such as Technical Reports in computer science; and
- seeking to transform the entire character of searching, classification, and retrieval of research in electronic format via digital library initiatives such as those funded by the NSF, DARPA and NEH.

At Stanford and other LRLs, additional initiatives are either under development or at programmatic levels. While the following specific examples are those of Stanford, peer institutions are undertaking similar efforts in the categories listed below:

a. reducing labor intensity of internal processing (the redesign of technical services);

b. providing passive and manipulable full-text data for humanists and other researchers;

c. providing on- and near-line networked passive and manipulable numeric data for social scientists; and

d. providing passive and manipulable multi- and hyper-media for research and instruction.

LRL Planning and Programs. Stanford and many of its peers are committed rhetorically and programmatically and in their planning parameters to a 3-pronged approach to resource accession:

1. Maintaining accession of more than 100,000 volumes per annum for the next 10 years with appropriate contingency planning for 10-20% fewer volumes if the economic and cultural factors involved in the mode. of production of journals allows a faster transition to full electronic formats;
2. Maintaining active specialized collecting programs of book, eclectic, archival, and manuscript materials in those fields where scholarship is well served in that manner;
3. Obtaining those electronic resources locally that best serve local scholarship, and identifying and enhancing local access to relevant remote resources.

The Identity and Functional Crisis. In order to carry out such plans creates great strain in libraries where financial restraint has been a fact of life for more than a decade. In Stanford local lore, the "killer pace" pre-existed computerization and electronic resources, both in terms of technology in service of the book and technology supplementing or substituting for the book. Since 1990, maintaining excellence and investing in and being innovative has had to occur in a context of the 3Rs of reduction - Repositioning, Restructuring, and Redesign. This had resulted in a tightening of the dialectical spiral, so to speak.

In the Collection Development Program of Stanford, 5 basic principles have governed resource accession since its beginnings in 1966:

1. Principle of breadth and depth of resources accessible;
2. Principle of program-conditionedness and selectivity;
3. Principle of specialization by subject, area, or language in recruitment and promotion;
4. Principle of format/medium blindness in execution of 1 - 3; and
5. Principle of seeking and maintaining sustainable collaborative enterprises with faculty, learned societies, other libraries, and with the publishing world.

Translation of these principles into practice has always been difficult, but especially so in the context of 20% fewer personnel, the closing of our undergraduate library and the absorption of its service programs into the research branches, including the main library, and the training and intellectual ramp-up time required by electronic resources.

Even without reductions in force and reductions in base funds, we would still be confronted by what we have termed the "both/and" dilemma - that is, learning what needs to be done to establish a system of transparently accessible electronic resources, carrying out the traditional tasks of resource identification and accession (collection development), resource classification and access (technical services), and resource interpretation (reference and information services) in an electronic environment, while continuing to do most of that which you have always done. This gives rise to issues of scalability and, internally, a sharpening of an age-old tension, if not contradiction, between public services and collection development, especially as the workload has increased quantitatively and qualitatively. All LRLs find themselves, in one way or another, confronting the issue not of what the next generation of librarians ought to be, but what the present set of librarians must become, on-the-job.

At Stanford, these issues were directly addressed in the Collection Development Program by a retreat held in April, 1994 entitled "Whatever Happened to Collection Development?" This retreat was intended to address the questions of scale, competing values, time constraints, the "both/and" dilemma, and whether or not we had begun to take "collection development" for granted and could still say that ours was a scholarly and academic endeavor, not just a service industry. Aphoristically, we referred to the problem as the question of Writing, Reading, and Time or as a set of 4Rs: Reading, 'Ritin', Reflection, and Research.

We identified degrees of engagement that would still be required if we were to be more than the shells of reference librarians who merely refer rather than showing how to get to something and how to use it and to understand the research inquiry at more than a superficial level. We concluded that the only way to do this, is to have some continuing relationship to academic disciplines and their "stuff". In descending order of engagement we identified six levels at which research librarians and bibliographers might operate:

1. Writing and the issue of scholarship in a discipline or field;
2. Writing and the issue of scholarly librarianship;
3. Reading and knowledge of one's fields or disciplines;
4. Reading and knowledge of the structure of the literature and structure of information in one's fields or disciplines;
5. Reading and the space-time to carry out informed selection responsibilities and resource interpretation duties; and
6. Space-time and the sense of living entirely on a day-to-day basis without time for reflection on collections acquired or resources accessed.

It is clear that we wish to avoid the sixth situation at all costs, and, as an optimal goal, we wish to obtain, the second level for all selectors - that is, writing and publishing as scholarly librarians, and as a practical goal at least the fourth level - that is, reading and knowledge of the structure of the literature and structure of information in one's fields or disciplines. It is important to note - and, if my conversations with other institutions' selectors and collection development officers are any guidance, this is not restricted to the Stanford situation - that actual contemporary experience effectively has disbarred the loftiest "knowledge of" goal of specialization - that is, continuing published scholarship in a field or discipline. It is also indicative of the felt anxiety about too-much-to-do that we would even raise the specter of the unread and unreflective subject specialist. While these 4R issues had always been present in both the print library and technology-enhanced print library, they have become especially acute today.

Conclusion

Beginning in the early 1960s when the money was easy, LRLs embarked on intensive resource accession programs for that wonderful machine-that-won't-go-away - the Book - and organized our libraries to provide access and navigation tools to it. In 1994, we find ourselves in a situation where the dominant form of source information for scholarship remains the printed artifact, but where substantive alternative forms of resources and communication are present.

We find ourselves in an environment where technology in service of the book alone has produced such a wealth of information as to raise the question of how to sustain access and provide navigation tools in order to prevent the paradoxical effect of impoverishing those for whom the wealth has been provided. Hence, "access to information" - a term I first ran across in 1972-73 in an annual report for the Stanford University Libraries authored by David C. Weber, Director Emeritus and admired colleague - has changed its meaning as we have moved from the "therein" of single libraries, to the "therein" of library consortia, to a relatively open-ended "wherever" the relevant information lies of 1985 and beyond.

It is within this changing context of librarianship that large American research libraries find themselves. At Stanford, our philosophy might be termed that of "directed coping" where another set of "R"s operate:

(1) Responsibility for maintenance and optimization of the established material and intellectual mode of production;

(2) Responsiveness to changes in the material and intellectual mode of production; and

(3) Reinvention of our function and our work through participation and investment in changes that enhance or transform the material and intellectual mode of production.

Each of these Rs has direct relevance for the "traditional" understanding and operation of collection development as well as for meaning in an academic setting that well may be radically de-walled as well as de-centered. But none of this can be done without subject specialization where "servants of enlightenment" not only have knowledge of and about what scholars do at more than a superficial level, but, who also have a knowledge how to operate and assist in mixed or completely non-print and non-artifactual information environments.

Let us close with a quote somewhat altered for the present era:

> Know the stuff of scholarship in whatever medium you find it. Important as is the knowledge of people, it is quite as necessary in order to bring the right book or other package of scholarship and the right reader together, to know the stuff of scholarship. We belatedly have been laying needed emphasis in our library schools upon information technology. We ought to have our books and other resources methodically arranged and accessible; we ought to put them in the reader's hands with as little fuss and delay as possible. Yet the importance of all this pales before the vital necessity of knowing what it is that we are classifying and making accessible. Therefore, read, read, read. Skim some books or other resources, steep yourself in others and scrape at least a bowing acquaintance with as many as possible. Someone has said that the librarian who reads is lost. The librarian who doesn't read isn't worth finding."

Hence, like Bacon, my plea and the purpose of my work life and the raison d'être of librarianship is to identify the most appropriate mix of machines from incunabula to hypermedia for the creation and production of knowledge. The rhetorical claims of emergent and alternative technologies would have us believe that "Time's arrow" points in only one direction and does so at such speed as to bring out the latent Luddite in all of us unwilling radically to alter what we do and how we define our work life. Separating hyperbole from substance is an issue for both scholars and librarians. While the forms and media in which the messages of scholarship are found display both change and continuity, the role of the librarian remains the same today as it was in the early 1960s - pathfinder, guide to the perplexed, selector, and practitioner and server of enlightenment. But, this can only be so if they keep on reading...

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"Books are doomed...[and]...to actively resist is to be a Luddite, with identical chances of success", see Lauren H. Seiler, "The Concept of the Book in the Age of the Digital Electronic Medium", Library Software Review 11(1):19 pp., January, 1992.

2. See Maurice B. Line, "The Publication and Availability of Scientific and Technical Papers", Journal of Documentation 48(2):201 for a fuller analysis of this model and its alternatives and from whom I have borrowed this approach.

3. It is significant that much of the context for what I say, if not at the specific factual level and not because I agree with all his positions, but at the general topical and categorical levels, was provided by Lancaster in one way or another between 1978 and 1980 in 3 works - Toward Paperless Information Systems, (NY: Academic Press, 1978), "The Changing Face of the Library: A Look at Libraries and Librarians in the Year 2001", Collection Management 3(1):55-77, 1979, and The Impact of a Paperless Society on the Research Library of the Future, (Urbana: Library Research Center, Graduate School of Library Science, University of Illinois, 1980).

4. See Charles Osburn, Academic Research and Library Resources, Westport: Greenwood Press, 1979.

5. I am indebted to Maurice Line, op.cit., for this characterization of Lancaster's views in the 1978 article.

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User Aspects of the ELINOR Electronic Library

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Abstract

The two-year pilot phase of the ELINOR (Electronic Library and INformation Online Retrieval) project at De Montfort University Milton Keynes has recently been completed.

The pilot has involved the digitizing of textbooks and other learning materials associated with the first year of the degree in Business Information Systems, and enabling students to access these materials via a computer network. An important part of the work of the research team has been to assess the success or otherwise of the electronic library from the user point of view, based on both objective and subjective responses.

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This paper describes the main features of the user interface, detailing how users retrieve and then read required documents. The preliminary findings of a small-scale user study conducted during the pilot are outlined, together with methodologies used. The paper goes on to describe some of the problems encountered by the team in obtaining user feedback, and suggests reasons for these. It concludes by looking at ways in which the team plans to address these problems and to scale up the user study during the next phase of the project.

1. Introduction

At the 15th International Essen Symposium in 1992, Professor Mel Collier, Head of the Division of Learning Development at De Montfort University, gave a paper entitled. The electronic library - virtually a reality? In this paper[1] he outlined the aim of the ELINOR (Electronic Library and INformation Online Retrieval) project, then in its infancy, as being to develop a fully electronic library environment within five years, enabling the information required by staff and students to be delivered primarily in electronic form or by electronic communication systems. This was to be achieved initially by digitizing materials currently available only in printed form, but would eventually, we hoped, lead to the development and incorporation of true electronic texts and multimedia.

In May of this year, we came to the end of the two year pilot phase of the project, and this paper presents some of our preliminary conclusions. The pilot has encompassed research into a range of areas, including the technology, copyright, charging mechanisms, and user acceptability. It is this last area on which this paper is focussed.

2. The ELINOR Pilot

De Montfort is a distributed university, now operating on eight campuses in four cities, spanning a distance of 150 km from north to south. We hope that ultimately the ELINOR project will assist us to manage our resources more effectively in this distributed environment, but to make the project manageable in its early stages, a single course at a single campus was selected with which to pilot the system[2]. The chosen course was the BA/BSc Business Information Systems degree, on the basis of the range of material required (computing, business, languages). The reading list for the first year of this course, which was our primary target user group, comprised a total of 240 recommended textbooks and ten journals, produced by a wide range of publishers. A further factor in selecting this course was our awareness that the same course was also being offered on our Leicester campus, thus providing a ready made control group of students with access to only print-based materials: ideal, as we thought, for carrying out comparative work when we came to our user studies. This eventually proved not to be possible because of issues of parity and equality between the two groups of students in terms of access to resources.

The basic objective of the ELINOR pilot has been to create an indexed electronic text and image collection database of course documents, including books, journals, exam papers, etc. which could be directly accessed by students and staff via networked Windows-based PCs on the Milton Keynes campus. Initially, this was within a very tightly controlled environment, with the electronic library accessible from just three PCs within the Information Centre itself. This has since been expanded to simultaneous access by ten users from any PC within the building. Our strategy for "collection development" - since at this stage we were still testing the water with the publishers - was to include in the library any document relating to the course which was either non-copyright (e.g., tutor's notes), or for which we had successfully negotiated a copyright agreement. Eventually this totalled some fifty-five titles from eleven different publishers. Amongst other conditions, the licences stipulate that readers may not copy files to disk, and limit the number of pages which may be printed out.

3. The User Interface

User acceptability has been perceived by the project team from the outset as being a key factor in the success or otherwise of the electronic library [3]. Because of this, a user-friendly interface was considered to be a high priority when the selection criteria were drawn up for the document image processing (DIP) system which would form the basis of the electronic library.

The pilot has used a commercial DIP system, PixTex/EFS, to convert printed documents into bit-mapped images held mainly as TIFF (Tagged Image File Format) Group IV format, with contents pages and indexes converted to ASCII to enable searching and retrieval. The system employs current Graphical User Interface (GUI) technology, based on WIMP (Window, Icon, Mouse, Pull-down menu), which has a number of advantages over menu or command-based interfaces: it is easier to learn; it provides a relatively common interface to a wide range of software; data exchange between different packages is simple; and the Milton Keynes campus is operating in any case in a wholly Windows environment, which means that all students rapidly become familiar with this type of interface.

The database itself is organised hierarchically, using the metaphor of the file room: filing cabinets, drawers, folders, etc. (**Figure 1**).

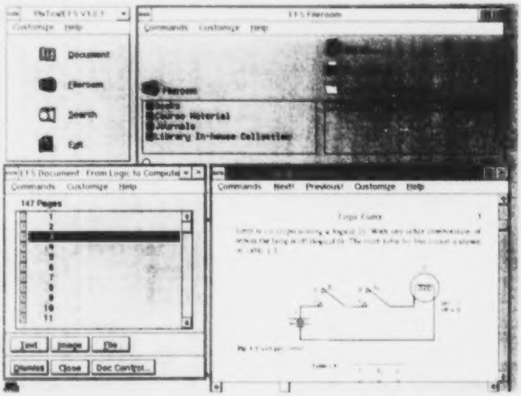
Customize Help
Document
Fileroom
Search
Exit
EFS Fileroom
Commands Customize Help
Fileroom
Books
Course Material
Journals
Library In-house Collection
EFS Document From Logic to Compute
Commands Customize Help
147 Pages
1
2
3
4
5
6
7
8
9
10
11
Text
Image
File
Dismiss
Close
Doc Control...
Commands Next! Previous! Customize Help
Logic Gates

Figure 1

We have organised the database such that each "filing cabinet" contains a particular type of document: one for books, another for journals, a third for course materials, etc. Each drawer then represents a broad subject area, e.g., computing, with each folder in the drawer representing a narrower subject, e.g. computer architecture, and so on, down to individual pages of individual documents.

3.1 Accessing the Electronic Library

The library may be accessed from any of the PCs in the building which houses the Information Centre by using a simple logon procedure. Once the library has been accessed, the user is able to first locate the required document, and then read it, just as in a traditional library.

3.1.1 Locating a Document

There are two routes which a user might follow in order to locate a document within ELINOR, again analogous to the steps one might take when using a paper-based library: either browsing the "shelves" - in this case, the database, or by entering a specific search term, which might be compared to using the library catalogue.

The interface for browsing uses the graphical representation of the hierarchical structure outlined above; the user clicks on the icon of the chosen filing cabinet, folder etc. until the image of the required page appears on the screen **(Figure 1).** On the whole, users seem to master this relatively easily, despite the fact that the file room analogy does not translate entirely satisfactorily into the library environment. The team has begun to carry out some preliminary work on enhancing this representation, for example, by displaying in graphical form the relative sizes of the various documents being browsed on the electronic bookshelf, and the relative size of each subject area **(Figure 2).** Each user will also be able to create his or her personal "bookshelf" for future reference.

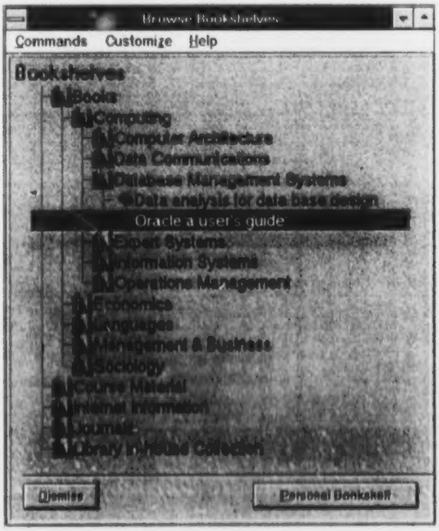
Browse Bookshelves
Commands
Customize
Help
Bookshelves
Books
Computing
Computer Architecture
Data Communications
Database Management Systems
Data analysis for data base design
Oracle a user's guide
Expert Systems
Information Systems
Operations Management
Economics
Languages
Management & Business
Sociology
Course Material
Internet Information
Journals
Library In-House Collection
Dismiss
Personal Bookshelf

Figure 2

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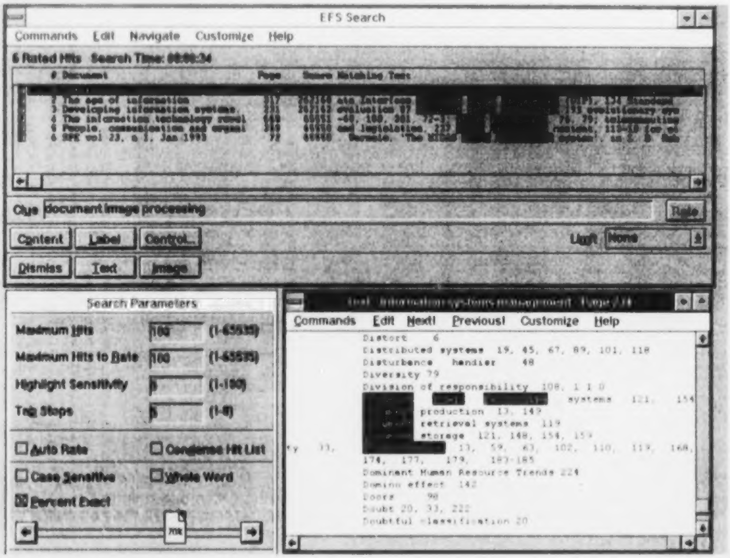
In addition, users now have access to the electronic library database using Mosaic. This has two benefits: firstly, it gives users a choice of interface; and secondly, it will eventually enable remote access to ELINOR, for example from study bedrooms, without the need for PixTex software to be loaded locally on each machine (although simultaneous access will still be limited within the terms of the PixTex user licence).

The search interface incorporates both a DBMS (Database Management System) engine, which searches on structured fields similar to those in OPAC records, and free text retrieval based on neural networks, a major advantage of this being that it allows "fuzzy searching" to retrieve documents regardless of spelling mistakes. Each user is able to set his own search exactness parameters. The result of a search containing a misspelt word, and with exactness parameters set at 70%, is illustrated in **Figure 3**. Free-text searching may be carried out on the whole database, or on specific filing cabinets or drawers identified by browsing.


EFS Search
Commands Edit Navigate Customize Help
Rate
Content Label Control...
Dismiss Text Image
Search Parameters
Commands Edit Next! Previous! Customize Help

6 Rated Hits Search Time: 00:00:34

```
  # Document                          Page   Score  Matching Text
  2 The age of information             317    [illegible]
  3 Developing information systems.    231    [illegible]
  4 The information technology revol   [illegible]
  5 People, communication and organi   [illegible]
  6 SPE vol 23, n 1, Jan 1993           72    [illegible]
```

Clue: document image processing

Limit: None

Maximum Hits: 100 (1-65535)

Maximum Hits to Rate: 100 (1-65535)

Highlight Sensitivity: 5 (1-100)

Tab Stops: 5 (1-8)

☐ Auto Rate ☐ Condense Hit List

☐ Case Sensitive ☐ Whole Word

☒ Percent Exact

70%

```
Distort    6
Distributed systems  19, 45, 67, 89, 101, 118
Disturbance   hendler    48
Diversity 79
Division of responsibility  108, 1 1 0
                                   systems   121,   154
            production  13, 149
            retrieval systems  119
            storage  121, 148, 154, 159
                           13,  59,  63,  102,  110,  119,  168,
174,  177,   179,   183-185
Dominent Human Resource Trends 224
Domino effect  142
Doors    98
Doubt 20, 33, 222
Doubtful classification 20
```

Figure 3

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3.1.2 Reading a Document

Once a required document has been located by searching the text pages, the user may view the image pages selected from the contents list. These pages, i.e. the greater part of the document, may only be viewed or printed, and cannot be downloaded or manipulated in any way, although it is possible to create notes using a Windows-based editor whilst viewing a document. It is also possible to drag the page up or down and right or left, and to zoom in on particular sections of the image - particularly useful for viewing diagrams. Images can be rotated, enlarged and reduced. The user can flick through pages by clicking on the *Next* or *Previous* button, or select a specific page by using *Goto*. It is also possible to lock up to four windows on the screen at a time, with each displaying a different page of one or several books.

The two techniques of finding and reading a document may be used in tandem, in that a new search for additional material may be generated by highlighting a term in the text page currently being read.

4. User Reactions to the Electronic Library

From the outset, the reaction of users was carefully monitored. Members of the target group received initial training in navigating the system, and thereafter a series of small scale user studies were carried out, based on a randomly selected subset of the target group. The numbers involved in the studies are too small to give any firm conclusions which may be applied to the population as a whole, but offer some interesting indications of areas where more work needs to be done, and of the type of question we should be asking.

4.1 User Studies

Greater detail of the methodology, analysis and results of the user studies may be found in (3), but in broad terms, two methods of data collection were used: a set of searching and reading tasks to collect objective evidence, coupled with a questionnaire to gain subjective reactions to the electronic library.

4.1.1 Reading and Searching Tasks

These tasks used the same subjects to compare the use of electronic and printed books, and modelled two common approaches to library usage: firstly, where a user is seeking an answer from a specific known document (equivalent to an author or title search on OPAC), and secondly where a user has a query but does not know where the answer might be found - typically, a subject search, during the course of which several documents might be consulted.

Students were asked to answer four questions using electronic books, and four similar questions using print materials, all involving a combination of searching, browsing and reading.

The resulting data indicated, perhaps as might be expected, that it is quicker to use the electronic library to locate and retrieve the item, rather than searching OPAC and retrieving the book from the shelf, but once located, is quicker to find and read the answer from the printed book. These early findings, however, are based on novice users, and it may be that later studies will show an improvement in using the electronic book with increased experience and practice. We also took care to ensure that, for the purpose of the study, all the necessary printed books were available on the shelf at the required time. In the real world, this could not, of course, be guaranteed.

4.1.2 Questionnaire

The questionnaire consisted of five sections: user background, especially previous computing experience; system usability; system usefulness; usefulness of contents; and general comparisons between the electronic book/library and printed media. Questions were mainly closed, with the respondent selecting one answer on a five point scale from *very satisfactory*, to *very unsatisfactory*. The results to some of these questions are illustrated in **Figure 4**. The general comments made by the students participating in the study seem to indicate that the usability of the electronic book is inferior to the printed book, but that the electronic library is a welcome development which is more useful than the traditional library OPAC. As with all questionnaires, the phrasing of the questions is crucial, and we would almost certainly have received a different response had we asked "*Would you prefer to have material in electronic form which can be accessed whenever you need it, or in the form of a book for which you have to compete with fifty other students?*" instead of asking "*Do you prefer to read from an electronic* *book or from a printed book*". Such factors will be taken into account in future user studies.

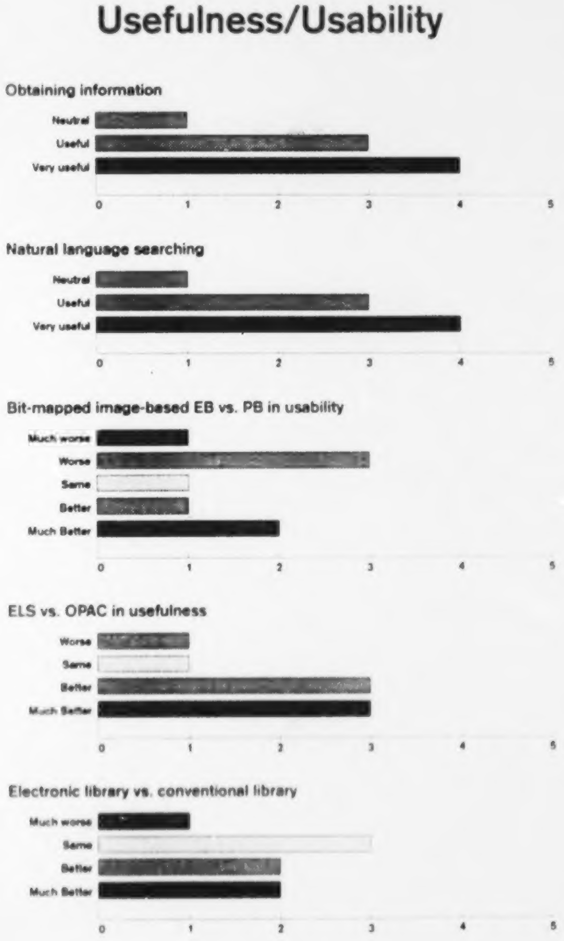

Figure 4

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5. Issues Arising from the Studies

As a result of the user studies, a number of issues were highlighted. A major problem has been the relatively low level of activity on the system, which has made the collection of meaningful data very difficult. The team has concluded that there are two main reasons for this, neither related to the user interface itself: database content, and lack of real involvement hitherto by the academic staff.

5.1.1 Content

As outlined earlier in this paper, the initial strategy was to incorporate into the library anything which appeared on the reading list for the BIS course for which publishers would give permission, and we still believe that this was appropriate for the pilot phase. Now that the electronic library has been proved to work technically, however, we feel that to be used to its full potential the database content has to be more clearly focused on material which students are required to use and which is not readily available within the traditional library. Our strategy now is to move away from targeting all materials for one course towards targeting high-usage materials across all courses, concentrating particularly on:

- books most frequently requested at Milton Keynes, based on an analysis of reservation statistics;
- books recommended for the short loan collection (development of an "electronic reserve room");
- an electronic "offprint collection" of frequently recommended journal articles;
- relevant out-of-print material;
- all appropriate non-copyright material (exam papers, course handbooks, etc.).

5.1.2 Staff Involvement

A greater level of involvement by academic staff is another key factor in encouraging students to make use of the electronic library. In particular, we anticipate working closely with academics to develop course materials designed for use within an electronic environment.

6. Conclusions and Future Plans

The studies to date have produced preliminary yet interesting results which offer a mixture of encouragement and disappointment. We know that the electronic library "works" in a technical sense, and are heartened by the positive attitude expressed by students to the general concept. Yet it seems that in order for students to use electronic texts in preference to the printed version, there has to be some "value added". The major factor here has to be accessibility: when the electronic library is developed to the stage where it holds all high demand and otherwise unobtainable material, when students are able to access it from their study bedrooms or workstations elsewhere on campus at any time of day or night, and when they are able to manipulate specially designed electronic course materials in a way that was never available to them before, the benefits of the electronic environment will become clear to them. These are the areas which the ELINOR team hopes to develop in the next phase of the project, and we anticipate that if we are successful, the results of subsequent user studies will be much more conclusive.

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Remote Use of the Virtual Library : End User Needs*

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Abstract

Thousands of libraries, colleges and universities, and businesses now provide Internet access to information, goods, and services. Due to the fact that this information is accessible to virtually anyone, the issue of how remote users can most effectively search for and use it is of great importance. Several critical and related needs have recently emerged in this area: What changes must libraries consider to make existing bibliographic databases more comprehensible and searchable to remote searchers? What are the critical components of the user interface that will steer a remote user successfully to the appropriate resources an institution offers through the Internet? How can an institution effectively use the structure of Internet browsing software to convey information about services and policies, as well as to provide a method for interaction with remote users?

Few guidelines exist, apart from Z39.50 implementation to support common search and retrieval command language, or simply making the existing database available and monitoring user performance.

This presentation examines end user searching needs that ought to be considered in a library's decision to make electronic resources Internet accessible.

* Paper not received in time due to extraordinary circumstances

The Function of a Traditional Library as a Virtual Library : A Comparison

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Sigrid Reinitzer got her Ph.D. at Karl-Franzens-University Graz in 1968. Since 1971 she is on the staff of the University Library of Graz. From 1978 to 1988 Ms. Reinitzer was head of the EDP-department; 1984 to 1988 deputy librarian and since 1989 she is the University Librarian. She is a member of the board of ELAG, member of VDB, DGD, LIBER, 2nd Vicepresident of VÖB (Vereinigung Österreichischer Bibliothekarinnen und Bibliothekare) and author of several books and articles in library science.

Abstract

The 400 years old University Library of Graz has always done different forms of information work. Founded as a Jesuit Library it was part of the worldwide net of the Jesuit Order. Already in its early years it was a library for public purposes. Also in these early years interlibrary loan was introduced within the Jesuit universities. After 200 years it became a state library with many tasks. In the 1970s the concept of an electronic library was started. Later on followed the concept of a virtual library based on three essentials:

- **an electronic library**
- **a library with many telecommunication possibilities**
- **a library as a workstation on many scholars' desktops.**

The electronic library is the early precondition for the virtual library. The functions are for example the OPAC, cataloging,

Publications of Essen University Library, Vol. 18, pp. 361 - 368, 1995

circulation, acquisition, serials control, interlibrary loan and so on. A very modern function is the distribution of electronic documents.

Telecommunication has grown to a huge network using superhighways, combining in the Internet one million computers worldwide. Telecommunication gives access to a vast amount of information.

The library as a workstation on many scholars' desktops is the latest development of a virtual library. The end user receives resources that meet his personal research or study needs. Campuswide networks for CD-ROM searches are introduced. For the years to come we expect multimedia in the form of text, image and sound via network communication.

Introduction

The University Library of Graz has now been engaged for more than 420 years in information work. The first 200 years it was the library of the Jesuit Order and at the same time a library for the higher classes and aristocrats of Styria. Early it established interlibrary loan with other Jesuit libraries of Europe. Its organization was similar to the Jesuit university libraries in Austria, Germany, Spain and Portugal. In the year 1773 the Jesuit order was dissolved and the University of Graz together with its library became a state organization.

The state university library became a public library, a library of the state university and an administrative library for the court. It was given the splendid rooms of the former Jesuit Aula and theater and equipped with many books from other monasterial libraries. The university grew and moved together with the library to new buildings at the end of the 19th century. In the 1970s the concept of an electronic university library was started. This was the beginning of an automated university library for 15.000 students and for 70 institutes belonging to four faculties.

At the end of the 1980s the first form of automation was followed by a concept for a network connected with Ethernet comprising the whole campus with six faculties consisting of 120 institutes housing in 60 different buildings. The university has meanwhile 32.000 students and 3.500 teachers. It is by size the second largest university in Austria. The library at present consists of 2.5 million books, distributed to the main library and eight special libraries and 110 other decentralized libraries. They all are administrated centrally by the main library with its 120 staff members. It is evident that the wish of the many scientists, students and personnel spread over considerable area of Graz has more and more been concentrated on a better library organization than the traditional form. Therefore, the concept of a fully automated library was developed for the main library as well as for the university bodies. The rapid developments in computer technology and the economic changes made it clear that the role of libraries and librarians as information intermediaries must undergo immense change.

It began with the installation of an automated circulation system for the closed stacks with 1.5 million books. An automated short title catalog followed. Both developments quickly became successful. Further improvements by the automation for the library of the Karl-Franzens-University Graz and its users were:

- the metropolitan area network (MAN) of Graz consisting of the libraries of the Karl-Franzens-University of Graz with the circulation system of GRIBS and the short title catalog GRIBS-INFO, the library for law and social sciences with its Oracle-based cataloging and OPAC-system FB-INFO and the integrated library system TUB-INFO of the University Library of Technology of Graz;
- the Austrian national journal database ÖZDB, which includes the journal data of more than 1.000 Austrian libraries;
- an online retrieval system with connection to more than 35 national and international hosts like DIALOG, DATASTAR, DIMDI or BLAISE;
- the online cataloging system BIBOS of the Austrian research libraries with its OPAC connected by Aconet and Ethernet with 21 member libraries including nearly all university libraries and the National Library of Austria;
- the local area network (LAN) with its CD-ROM information system used since 1992, which offers nearly 40 databases on more than 100 CDs, which is distributed to more than 500 PCs via the local area network within the campus 24 hours a day, also on Sundays and holy days.

The **virtual library concept** has been written about widely in the literature. D. Kaye Gapen defines the virtual library in his book "The virtual library: knowledge, society and the librarian; 1992" as "the concept of remote access, to the contents and services of libraries and other information resources, combining an on-site collection of current and heavily used materials in both print and electronic form with an electronic network which provides access to and delivery from external world library and commercial information knowledge sources".

Our 400 years old University Library of Graz which comes, we think, at this time near to the status of a virtual library, represents a good combination between traditional library and a wider concept of an electronic library. It includes very rare and valuable medieval manuscripts as well as incunabula and a stock of several hundred thousand old and rare printed books. All of them are highly esteemed by the visitors of exhibitions and by the scholars using these treasures.

The holdings of scholarly journals and periodicals and modern scientific literature in printed form are the backbone for the lectures of the professors, for the progress of the students and for the general public using the library with eagerness.

All of us know the advantages of printed books: they are handsome, easy to use, and they don't depend on the problems of datalines, networks, electric power, computer hardware and the ability to handle complicated often altered systems. Besides this many of our readers like to come to the library and many really feel at home there.

On the other side we must admit that the traditional library is not always the quickest way to come to information: It is cumbersome to look through voluminous bibliographic handbooks, it takes time to use the traditional interlibrary loan services, it may have restricted opening hours. But generally one can say that a wellcrafted book is a lovely possession.

Many people confuse the electronic library with the virtual library. But the two types of libraries are quite distinct:

- The **electronic library** is the first precondition for the virtual library. The electronic library is the kind of organization of the University Library Graz as we have been working on it since 1980 to the present. The automated functions are: circulation, OPAC, cataloging, acquisition, serials control, online retrieval, CD-ROM, document delivery - but this last mentioned function is not yet satisfactorily solved by the computer systems in the University Library of Graz.
- **Telecommunication** is the second essential for a virtual library. The networks are growing fast worldwide, based on the high speed and low-

cost policy. The Internet uses a single protocol, TCP/IP (Transmission Control Protocol/Internet Protocol), and connects some million computers all over the world. The most important resources in these networks are the fully open OPACs of all the libraries connected to the Internet, including the biggest of the world like Melvyl, Carl or the small Austrian OPACs, which I mentioned before, like BIBOS, ÖZDB and GRIBS.

The End User and his Needs

The most innovative aspect associated with the virtual library is highlighting the end user's requirements. He receives a set of resources that meet his personal research or study directly. The users' needs are by no doubt multimedia resources, that means text, image and sound. The workstation includes one gigabyte of memory where the user can collect the information in multimedia mode. He can add personal notes to the documents, make special correlations and save everything for his reading session. As we are planning in our new library building - which is now under construction - a special media center for our university, we are working for this planned media center on the realization of the just mentioned needs.

We have already been successful with the installation of a **workstation for blind users**. This PC-installation has special functions:
The keyboard is equipped with a braille-line, a printer for braille-output, an output in language format in German, English, Spain and French, a scanner with the possibility to transfer the text into the PC, so that it can be formatted for the blind readers. The workstation for the blind users is also connected to Internet and allows to read newspapers, which are digitalized and stored for this purpose.

With the gradually approaching of technological developments the "virtual library" or "library without walls" becomes a reality. Telecommunication capability links a user to a personal computer with both local and remote libraries. Bibliographic networks for shared cataloging initiated libraries in the use of telecommunications about 10 to 15 years ago. The ability to link libraries through telecommunications made possible state- or country-wide networks like those in Austria called Aconet, in many other European countries e.g. JANET or SURFNET and in the United States like WLN (Western Libraries Network).

The development of remote databases with stored indexing information to millions of journal citations was another landmark in library automation.

Accessed through commercial telecommunication links online databases have saved countless hours of user's time and have streamlined research. Access through serial line interfaces improved over the years from 100 to 9.000 bps (bits per second). With the improved speed of transfer users could transfer larger documents at lower costs. Improvements in telecommunication have enabled libraries to use bibliographic networks and to search online databases. Many additional capabilities are available today, including electronic mail, telefaximile, document delivery, voice mail, electronic publishing, or the Internet which is one of the most exciting tools of telecommunications for libraries. At present a huge amount of institutions are connected, most of the important libraries have made their online-catalogs available for remote searching.

Management issues like standards, copyright and licensing have to be solved as bibliographic and citation databases evolve. The 1990s will be an area of transition:

Improvements of telecommunication and technology make the so called scholars' workstations and expert systems possible. GUIs (Graphical User Interfaces), multitasking will be enhanced with the addition of audio and video information. Data-transport media will shift from copper and fiber to wireless. Issues of copyright and licensing will reach the confrontational point, however with innovative solutions emerging. With so much information available, however, other issues must be addressed: we need skills such as critical thinking to help us to deal with the information overload. We need to rethink the instructional process and help faculty members to be ready for a new role in an environment where students have equal access to information and where they may be more expert at finding it. Our senior students need special help in using all this telecommunication and information technology. Therefore we installed a special department where the senior student can find special introduction. The retired director of the library is in charge of instructing the senior students in this sense. Administrative issues will also confront the libraries.

The Austrian research libraries are on the way from the function of traditional libraries to virtual libraries. An American consulting firm was retained by the "Planungsstelle für Wissenschaftliches Bibliothekswesen of Austria" to assist in analyzing the status of library automation in the academic libraries of Austria and to make recommendations for the future. The recommendations were as follows:

- Undertaking a national program for library automation and resource sharing.
- Establishing a single agency to develop and coordinate the program.
- A shared national system supporting cataloging retrospective conversion and interlibrary loan should be the keystone of the program.
- Procurement and implementing multi-user, multi-function integrated local library systems with the interface shared national system.
- Smaller libraries should share systems with other libraries.
- The systems should be purchased in a joint procurement.
- Vendor viability should be a major criteria in the selection of a vendor.
- The implementation of each local library system should be phased.
- A full-time system manager should be appointed for each system.
- Implementation of the entire program should take over the next four fiscal years.
- Undertaking a cooperative retrospective conversion program.

The recommendations concerning the status and trends of the market situation were: increasingly international, fewer vendors, turnkey offerings and multi-year contracts.

The general system requirements should refer to a system, which shall have operated successfully in a multi-institution environment, furthermore it shall include acquisitions, online ordering (EDI-based), serials control, online serials claiming (EDI-based), cataloging (with authority control), cataloging support system interface, circulation, reserve book room, inventory control, patron access catalog, information and referral, media booking, journal citation files, imaging, non-bibliographic files, CPU gateway, Z39.50-based linkages, interlibrary loan.

The above mentioned proposals were presented to representatives of the Ministry of Science and Research and to the directors of the Austrian research libraries in September 1994. The auditory had the impression that a combination between the functions of traditional libraries and virtual libraries will be the best solution for the future.

May I close my paper with a sentence of J. Kessler (PACS-L, Nov. 17th, 1992): "Navigating through information sources is what librarians do, it's what we have done for centuries. It is nice to feel needed: it's reassuring to discover how badly we are going to be needed by the information network users in Europe and elsewhere during the next years."

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Managing the Virtual Library : Issues and Challenges

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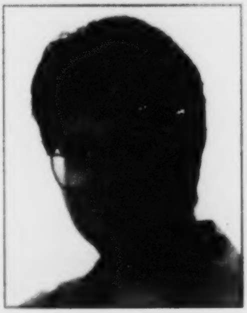

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Abstract

Advances in information storage and communication technology have made it possible to transport all recorded formats - sight, sound, motion and text - to wherever networking infrastructure exists. In this virtual library environment anyone equipped to

Publications of Essen University Library, Vol. 18, pp. 369 - 382, 1995

reach the network can potentially retrieve the resources it offers. Paradoxically, while access to information has been technologically facilitated through Internet, the process of locating desired information has become more complex for the user. Issues confronting virtual library managers are discussed - computer literacy, the user interface, user education, and organization of electronically available knowledge. The challenge to library professionals in the new virtual library environment is to develop and implement standards for organizing the diverse electronic resources available, and to facilitate information retrieval, in order to continue to provide the best possible service to the largest number of users.

The Virtual Library Environment

The "virtual library" is becoming a reality. We can no longer deny or postpone its existence in the information marketplace. The application of computers to library service has evolved from simple housekeeping tasks such as shelf list and location control, to sophisticated user interfaces within libraries via online catalogs, CD-ROMs and multimedia, and now global communication via Internet, enabling instant access, by anyone linked to the network of networks, to thousands of remote sources of information. Library materials now consist of photos, speeches, animation, books, journals, articles, audio and video cassettes, laser disks, class notes, databases, software, and so forth. For the first time in civilizations' history, all the recorded formats - sight, sound, motion, and text - can be conveyed in digitized form. Digitized, all these library materials can be transported wherever computer networking infrastructures exist, and anyone with access to a network can reach the resources it offers. All of these combined comprise the virtual library, an untamed beast with tremendous potential, whose value for all possible users has yet to be realized.

How does this new information environment affect individuals' access to information and their ability to obtain desired knowledge? How do we library professionals intend to fulfill our mission of enabling all users to access any available resource for education and research? Clearly, the main tasks at hand for library professionals today are to facilitate electronic access, and to organize the chaotic and immense body of electronic resources available through Internet. By fulfilling these roles we will be able to integrate the vast resources of the virtual library with the repertoire of services libraries have provided to users.

User Access to Internet. Even though access to Internet has been expanded beyond the original user base of academics, researchers and scientists, to include commercial organizations and private individuals, economic and geographic barriers to access are still a major factor.[1] Those who do not have free access to Internet through an employer must pay by subscribing to a service such as Compuserve or America Online. Thus, the poor are at a disadvantage not only by their inability to pay for access, but also the inability to afford the necessary computer equipment and training to enable it. The public library is one of the few institutions capable of addressing this problem. One challenge is to ensure that public libraries in all countries be connected to the Internet, and to lobby for the necessary financial assistance from public and private sectors to make this happen.

The second barrier to access is geographic. Connell and Franklin point out that in the U.S. most telecommunication nodes are based in urban areas, placing residents of rural areas at a disadvantage in the growing information economy. They warn that failure to provide access to the Internet for needy rural and urban groups may endanger the democratic and economic future of a country. "Citizens cannot participate effectively in a democracy without information, and the Internet may become the single most important source of information."[2] Many jobs today are information based, and those without access and the skills to use the Internet will be unable to compete in an information economy. If there is a vital need to improve the telecommunications infrastructure in rural America, the need is even greater for populations in underdeveloped countries.

Literacy. Our basic premise is that providing local access means not only creating electronic infrastructure and networks, but also giving a broad range of people the know-how they need to access those resources and networks. The virtual library requires multiple skills of the user in order to be able to search and use its resources.

A society's definition of 'literacy' develops hand in hand with what its citizens must be able to do to function successfully within the society. Literacy once meant the ability to read and write, but in today's technologically advanced times, simple skills of reading and writing are no longer sufficient.[3]

Literacy in today's world also includes:

1. Visual literacy, especially the ability to understand and use different forms of media.
2. Computer literacy and basic technological and scientific knowledge, without which it is impossible to grasp the complexities of today's world.
3. Bilingualism (or multilingualism), in order that the flow of information from sources outside one's own country (and often from within, as well) will be comprehensible.
4. Information literacy, a set of skills for lifelong learning.

Visual Literacy. The multiplicity of formats and media available in the virtual library, i.e. information in its authentic forms, will change the way people access and use information. People will learn what they need to know by accessing whatever forms may be useful for their immediate purposes, and will be able to reorganize the information to meet the needs of the moment.[4] Electronic technologies are capable of breaking down the barriers of knowledge containers and permitting an intellectual access not possible before. This has led to a change in our definition of what constitutes a unit of information. Previously, a unit of information was a book or an article, and it was described as a whole, and only retrievable as such. With the ability to retrieve and manipulate full text and images, each individual bit or item of information is a unit. Users must be able to interpret visual images, video, animation, graphs, often detached from a familiar context.

Computer Literacy. Efficient and effective access to resources in the virtual library is dependent on the user's ability to communicate through a computer. Irene Sever has likened the situation of library users in a virtual library environment to a form of culture shock.[5] According to Sever, today's library has many characteristics of an exotic, alien environment, especially to adult users: its language is unfamiliar and specialized and evokes incorrect associations. The form of the equipment creates difficulties to overcome: screen versus printed page, vertical positioning of reader screen versus horizontally placed bookform, the need to press combinations of keys of baffling complexity, the difficulty of mastering the order of functions necessary to run a simple "user friendly" program, the failure to understand a program created by computer experts for the use of novices.

While we do not long for the days of dog-eared card catalogs and the labor-intensiveness of their maintenance, as do some nostalgic researchers,[6] we can empathize with the average user's feelings of being lost and on unfamiliar territory. Most users, at least in our country, lack the elementary typing skills required to be able to converse easily through a keyboard. And imagine that in Israel, they are faced with a multilanguage keyboard on which one can type in English, Hebrew or Arabic, if you know which shift and function keys to press, of course.

The generation of youngsters growing up in Western society today, where computers are more commonplace, are acquiring computer literacy in much the same way they learn language and visual literacy. We must also help the current generation of adult users, who have not had the experience or opportunity to internalize computer literacy, and users in less developed countries, to adapt to the electronic information environment. Facility in the use of computers is essential in the electronic library for individuals who seek knowledge, and our school curricula must, therefore, include computer literacy as a basic competency. The computer and the network are the tools for data storage and retrieval; similarly the computer and network are the tools for the communication of information, ideas, and knowledge.

Bilingualism. The concept of a virtual library is geared to the needs of an Anglo-Saxon information society where English is the common language. In other countries, citizens will have to be literate in two or more languages in order to be able to function in the virtual library and make use of its resources without the costly need for translation.

Information Literacy. Connell and Franklin discuss this additional need, defined as a set of skills and attitudes for lifelong learning. Information literacy is directly related to critical-thinking skills and emphasizes activities such as selection, rejection, evaluation, organization, topic definition, and question definition. Included also are such topics as the value of information, ethics of information use, and information consumerism.[7]

One justification for the existence of the library has been its role in the education of society. The Internet can open up new avenues of cooperation between educators and librarians, and enhance the role of librarians as educators. A new student-centered model of learning is more appropriate in the Internet environment, in place of the teacher-centered classroom in which the teacher claimed a monopoly on knowledge. The role of the teacher shifts from instructor to facilitator and coach, whose goal is to empower students and foster multiple processes to learning.[8] Within this model, "librarians can teach the use of resources on the Internet, design services that are customized to individuals or groups, and promote standards that support international sharing of information."[9]

Librarians must take an active role in developing more and simpler retrieval tools for users, so that accessing the virtual library will be no more difficult than using an automated bank machine. It is easy to flaunt the virtues of instant global access, but even for the "experts" information retrieval on Internet is still far from being simple or efficient. The virtual library provides new challenges and opportunities for applying our traditional analytical, indexing, abstracting and educational skills to bring users and knowledge together.

Organizing Knowledge in the Virtual Library

Even when a basic level of computer literacy prevails among users, many will maintain that the user friendly virtual library is still an illusion because of the chaotic state of the information within it. Navigating the Internet seems foreboding and mysterious. The environment of organized, comprehensive, and accessible resources scholars expect in a library does not yet exist electronically.

Standards and Tools. If you have traveled at all along the information highway, you will no doubt have noticed that there are no agreed-upon rules for organizing the knowledge that can be accessed. Each institution has created menus or help screens as it sees fit, in order to attempt to assist the user in forming a mental map of the information that is available. Thus, there is no uniformity of screens, options or categories of information available among Gophers, much less uniformity of commands among online library catalogs available for browsing. Israel, as a matter of fact, is the only country that has a national network of university libraries that all operate within the same automated system called "ALEPH." Users who search any of the university catalogs can use the same commands and will view the same screen format for the data retrieved. ALEPH also provides online union catalogs for cross-library searching of monographs and serials. In the current virtual library environment, how feasible is it that a single user will be able to master hundreds or thousands of different systems in order to retrieve the information that is needed? Unless we want the Internet to remain the personal playground of an electronically savvy and enlightened elite, a broad, coordinated, easy-to-use structure for identifying and evaluating resources available through the interconnected networks is essential.

In the current network environment, it is very easy to become suddenly overwhelmed with a large volume of information by typing just a few words. The user who requires a few highly relevant documents - longingly called the perfect twenty-item search in online retrieval circles - will not be impressed by an information retrieval system that returns thousands of records in random ordering. Some form of user-driven filtering and profile information needs to be incorporated into networks to provide the same flexibility and level of control over retrieval that users have come to enjoy in certain well-designed CD-ROM products and commercial online database services. The typical library information query is often unrefined. Effective subject-oriented retrieval of data on Internet will require the inclusion of some quality control in the form of thesauri, authority headings, as well as the ability to limit by language, country, dates, format, medium, intended audience, source authority, location, and so on, in the retrieval system.

Some success so far has been the ability to put up systems of distributed information servers, such as Gopher and World Wide Web, but these are of limited value because they only enable browsing as opposed to deep searching. The present efforts at creating catalogs and indexes of Internet services are quite basic and not professionally maintained. "Agents" such as Veronica and Spiders are attempts to automate this process by providing "subject" access through keyword searching of Gopher menus. As David Price rightfully remarked, Veronica's serious limitation is that it only indexes what the information providers have put on their menus. The menu items are retrieved out of context by Veronica, and thus have lost the implicit information that would have been apparent to the "browser" who accessed the menu via the hierarchy in which it was placed. This will be readily apparent to anyone who tries doing a Veronica search for "Read Me."[10]

WAIS, a powerful service which enables large amounts of data in files or directories of files, to be indexed and searched also has its limitations, according to Price. It does just a free text search and lacks the ability to "search by forms." In order to improve WAIS, an algorithm was developed for rating hits. Price continues:

> This is a good example of how we need the involvement of information scientists in the development of such tools. For example, if I am looking for Sever's phone number (several digits with one mention of Sever) WAIS would put the file with this information low down on the hit list, preferring chapters of Shakespeare in which heads and limbs are being severed on every page.[11]

Mosaic, the most recent addition to this list of applications, is a hypermedia tool on the client side that uses a graphic user interface in Windows. It can use a variety of protocols to access distributed servers, thus providing a single interface for the user to the services mentioned above and several others.[12]

The chief characteristic shared by all of the tools mentioned is that they operate fairly reliably when the search target - a database, server or document - is known to exist by the user. This is what librarians usually call a known item query. One of the chief weaknesses these systems share is that they do not help the user to determine an appropriate starting point for a query, and thus do not perform well when the information request is subject-oriented. Nor do they help the user filter out or limit the vast universe of information available to a manageable number of relevant items. Gopher construction is considered by many to be the logical purview of the librarian in order to develop improved retrieval on the Internet.[13]

David Price mentions the progress under way in the important work being done by the U.S. Internet Engineering Task Force to develop standards for cataloguing the Internet.[14] Already URL's (Uniform Resource Locators) have been widely adopted. Currently under discussion are URN (Uniform Resource Names), which are the net's version of ISBNs, the concept of URN servers which would ascribe the URNs to information sources (files), and URI (Uniform Resource Identifiers), which are added information, like subject headings, to increase information retrieval.

The issue is not only how to organize, but what to organize. Traditionally, the library catalog was a reflection of information stored and available within the library's confines. Now that other libraries' catalogs and full texts are accessible, should we reflect electronic availability of remote sources in our local online catalogs, and how? We lack adequate rules for cataloging and describing electronic documents, and we have no standardized format for presenting full text documents and identifying them. According to a report in the 1993 Bowker Annual, the USMARC Advisory Group and the Machine-Readable Bibliographic Information Committee have discussed the need for the MARC record to include information about network-accessible resources.[15] Some libraries have begun to list remote electronic sources and their locations in their own online catalogs. Others have loaded external databases or texts on their own systems, so that the user will be able to function with one uniform query language to access all types of information.

User Education. A hierarchical model of information skills, proposed by Mulder and Campbell as a framework for developing user instruction programs[16], can also form the cognitive basis for the development of a supercatalog to facilitate users' interaction with the virtual library.

Contribution to Knowledge
Management of Information
Evaluation of Information
Retrieval of Information
Analysis of Information Problem/Needs
Understanding the Structure of Information
Awareness of Information Services Resources

Hierarchy of Information Skills

These same skills have formed the backbone of mediated reference service, where librarians have traditionally assisted users by identifying resources, enhancing modes of access to them, and enabling users to connect with, and use, appropriate sources. In the virtual library world, users do not have to be physically present in a library building to access information. However, the user, facing his computer screen alone in a home or office, will still need answers to four basic questions: (1) Where am I? (2) How do I do it? (3) What am I trying to do? (4) What do I do with it?[17] The challenge is to translate and transfer our sophistication and expertise in answering these questions into a simple electronic retrieval and navigational tool for the user. We envision a supercatalog where the user will easily perform a global information search, and then be able to display, view or hear the electronic resources retrieved, or obtain a list of the locations of those not available online.

The virtual library environment requires us to rethink how we will assist and instruct users whose expectations and demands will most certainly have changed along with new levels of speed and accessibility. Users will want highly specific instructions on dealing with the needs of the moment. In addition to the face-to-face reference encounters and familiar modes of guidance such as group lectures, course-related instruction, and workbooks, new modes of interactive, hands-on, hotline and distance training will be needed. For Virtual User Assistance, Eadie foresees Hyper-Ref: user-accommodating systems with help screens whenever you want them, and a 24-hour a day multilingual reference service for those out-of-time-zone perplexities.[18]

Managing Costs. In order to provide user access to online resources libraries must make a tremendous investment in hardware and software that are constantly being upgraded and revised. Changing technologies and software place an additional strain on the library manager's job of balancing increasing costs and user needs. Perhaps the following scenario that took place in our library is similar to one of yours. The University of Haifa has grown from a small satellite college of the Hebrew University in Jerusalem, with 4,000 students in the 1960s, to a major institution of higher education comprising a student body of 13,000 with 1,200 faculty, and supported by a library collection which has grown from a few thousand volumes to over 1,500,000 items, including microforms and other media. About 15 years ago we acquired our first computer, intended only for technical services, and which the staff had to take turns using (and which, by the way, we could not even give away, when it was subsequently replaced). At the time of this writing, we have 87 terminals stationed at various access points for public use, in addition to LAN remote access for about 150 queries at one time, 73 more terminals perched at different internal workstations, 38 PCs linked on a local network to host nearly 60 different CD-ROM databases, 20 additional PCs for other software programs, and two multimedia workstations for this exciting new medium that we have just begun to explore.

While this growth is impressive it is also problematic. Facilities that were originally designed for books, must be redesigned and rewired to provide space for computers and terminals. Our brief experience with technology has shown that hardware must be either replaced or upgraded at least once every five years in order to provide the desired functionality. Outdated hardware is not supported by manufacturers, and increasing complexity of technology inevitably requires more financial support. New technologies do not enable easy conversion of information from old hardware to the new. The cost for all of this is very expensive. While our university has been relatively generous in providing funds for automation, the growth of our budget for hardware has not paralleled that for collection development.

This point revives the decade-old discussion of ownership vs. access. Should we still be investing millions of dollars in collection building and maintenance, or would these financial resources be put to better use if invested in the hardware and related software, and training, continuously required to assure and improve our access to sources already available in, and accessible from, other collections?

Decision makers need to be educated and convinced of the new realities of information provision, in order to make the proper realignments of budget allocations. Librarians must convince administrators that the massive electronic resource sharing which is not only possible, but indeed desirable, will be cost effective, but that it will not be cheap. Sprague has suggested that a segment of the university community deserving of more attention is the administrative and non-professional staff. By developing services to meet their needs, the library's institutional position and role will be enlarged and enhanced in the eyes of the administration. The library might then have the support of campus administrators in its competition for scarce funding dollars.[19]

It has been suggested that the future library will not need to be nearly as large, because it will require far less physical materials on site. Something like this is possible, but only if that is what users want. In our own library, users of our new law research collection were very pleased to be able to access Israeli Laws and Supreme Court decisions on CD-ROM, but insisted that the library provide printed versions to foreign sources rather that relying on online access to Lexis.

Technology alone will not ensure improved information access. The rapid pace of technological change requires an ongoing process of training for library professionals in order to keep up with new developments. New positions are being defined to reflect libraries' visions of a state-of-the-art information environment. Position vacancies recently posted on the Internet by North Carolina State University included a "Networked Resources Management Librarian/Team Leader," "Librarian for the Organization of Networked Resources," and a "Client Services Librarian for Networked Resources."

New collaborative ventures with other professionals in the organization are also proving to be effective. Creth has described the experiences of several universities in which librarians and computer center professionals have pooled their knowledge and technical expertise to significantly impact instruction on campuses, to teach individuals about the new technology, and to enhance services.[20] In some universities the combined efforts of technologists, librarians and faculty have developed a knowledge management environment that has resulted in new products and services, and the integration of information technology into improved education.

Conclusion

Librarians have a rich tradition of service, aimed at trying to provide the most effective library programs, for the largest number of users, within the limitations of the available tools and financial resources. We must begin to apply some sound principles of management to the virtual library and to organize the thousands of sources available in it, if we expect users to be able to access this research tool, and benefit from its vast resources.

Technological innovations, like the Internet, have potentially democratized the world of information by making it universally accessible. Librarians as knowledge managers have a crucial role to play in transforming today's library from an information warehouse to a dynamic information hub, that will provide access for individuals to all publicly available information resources. Through our expertise in organizing information and understanding users' information needs and behaviors, we must develop a simple key to the Internet to ensure that its treasures can be unlocked by more than those few who are already familiar with its culture and rituals. Standards and criteria for describing electronic sources, as well as intelligent and efficient retrieval tools are necessary to facilitate the user interface.

As Jesse Shera wrote 20 years ago, the mission of the library still is to bring together human beings and recorded knowledge in a fruitful relationship as is humanly possible.[21] As we implement the virtual library, it is not enough to build a technological infrastructure. We must lay an intellectual foundation as well, rethinking what it takes to bring together human beings and recorded knowledge.

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Academic Library Users and Electronic Retrieval Systems

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Abstract

The new reality of electronic information retrieval in academic library demands new instruction methods by reference librarians. Two viewpoints are offered: 1. Academic readers, based upon a survey, divided into computer literates and computer illiterates. The former lacked retrieval precision, either because of lack of training or because of over-confidence. The latter objected to electronic catalogue and CD-ROM searching because of culture-shock related reactions: Anxiety, hostility, supremacy, inadequacy. 2. Reference librarians, need to use various measures like basic training sessions, specific problem help and written manuals. Based on the experience of the University of Haifa Library,

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[*] Irene Sever could not attend the symposium due to extraordinary circumstances.

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suggestions for solutions are made: introduce information retrieval as an obligatory course in the first year of academic studies; have intensive individual training sessions for staff.

The retrieval of information in academic libraries by electronic means is today an established fact: the era of the card catalogue, heavy tomes of encyclopedias and shelves of bibliographies is passing and scholars in academia face a new reality while reference librarians must change their methods of instruction to conform to the new situation.

The Academic Reader

First, the point of view of the users:

A number of observations and interviews were carried out in the University of Haifa Library regarding the problems that users feel they face when seated in front of the computer and CD-ROM screens. In all, 80 randomly approached users of computer terminals were interviewed. According to their responses two main categories of users could be defined:

A) computer literates and

B) computer illiterates.

Category A: The Computer Literates

Computer literates among the staff and students of the university were found to have acquired the rudiments of computer literacy in the past years, and more than half of those interviewed used personal computers. However, the predominant purpose for using them was word processing. In practice this meant familiarity with a computer keyboard and the ability to use basic commands through the use of manuals or on-screen help menus. Still, even the relatively knowledgeable habitual user of a word processor rarely understood the principles underlying the program used, seldom availed themselves of all the sophisticated features available in the program and needed expert assistance whenever some more complicated effects than plain text and footnotes needed to be carried out.

Among this group of users some 60% of those interviewed reported that they found it difficult to read text on screen: even the modern screen which replaced the old green ones did not seem to make protracted reading comfortable or even possible. Users of word processors reported that they continually printed out their half-baked drafts in order to read them more comfortably from the written page, and in the library the printers are clattering continually, presumably for a similar reason. 80% of all the subjects also reported that they found it hard and inconvenient to copy information from the screen and therefore made printouts instead.

Among this type of computer users three sub-groups can be described:

a) users, belonging to the younger generation (aged 21-30) reported that they had acquired computer literacy in their teens by playing computer games, teaching themselves to use Basic or learning computer skills in high-school. Thereby they had some basic notions of programming, understood more or less the inner working of the hardware, and were capable of writing some batchfiles of their own.*

Three of our subjects belonged to an older age group. They reported that they were interested in computers in general and had learned together with their teen-age children.

In addition to the use of computers for computer games and word processing 15 of the subjects in this group, both young and old, had lately learned to use Internet and Bitnet for electronic mail, and were enthusiastic users of this kind of communication. Electronic mail, however, does not require the user to understand how the system works, but only to follow some relatively simple routines. Whenever a difficulty arose, these users were not always capable of solving the problem, but turned to the "experts", provided by the computer services of the university. Even when given an explanation of why the system failed to perform accurately, the explanation was rarely enough to teach how to solve a similar problem in the future.

Still, despite the level of their skill and understanding, the bibliographic searches of this type of users were efficient from the point of view of computer use, but their ability to evaluate the result of their search and the precision of their retrieval was not uniformly successful. The experience in computer use based on word processing, e-mail and computer games did not necessarily mean that this kind of users had the skills necessary for adequate and precise information retrieval. Knowing the correct commands did not include the ability to formulate their search in the most appropriate manner nor did it lead to a full and precise list of bibliographic sources.

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* Obviously, this group does not include professional computer programmers and engineers. None of our subjects happened to belong to such a category.

b) a second group of users, some 62% of our computer literate subjects were young people who had reported that their background knowledge of computers acquired in their teens had little or no difficulty when facing a computerised catalogue system. They used help menus effectively and explained that all they needed was some basic introduction into the peculiarities of the particular program they were expected to use. However, closer inspection of the results of their searches revealed that they tended to believe that their skill in using the computer automatically meant that they mastered retrieval correctly and with relevant results, and therefore they trusted that the computer was giving them complete and accurate answers to their queries. They reported that they rarely if ever checked the precision and reliability of the list of items on their printouts. Also, while being proficient in the use of the computer they were found to be less skilful in using the library itself and could be seen wandering among the stacks with their long printouts having trouble translating the lists of bibliographic items into the correct location of books and periodicals, even though the stacks are clearly marked and the library holds extensive orientation sessions. Thus, while the computer and its retrieval program were used quasi-effectively, only the first, most superficial stage of the information retrieval was accomplished. Those belonging to this group could learn to use the most sophisticated features of the search programs, but they said they did not do so, because of their implicit belief that what they were doing so confidently was the best that could be done.

Category B: The Computer Illiterates

The third group of subjects, some 40% were composed of both young and old, who, when confronted with the computer and its keyboard seemed totally unable to relate to it. The machine readable retrieval of information was so threatening and caused such anxiety, that a confrontation with it was mostly avoided altogether. This apprehension existed not only among the older generation, but also among some young students, who apparently had not been socialised into computer use in their high-school days and therefore approached the whole concept with trepidation. The difference between young and old seemed merely to lie in the psychological acceptance of the inability to cope. The feelings of the older users were mixed: on one hand they felt inadequate, because of their inability to master a technique which youngsters apparently had no difficulty with, while on the other hand they seemed to feel that the new routines were vastly inferior to the old well known system of manual card catalogues and could not see any advantages of the computerised systems of information retrieval. Some even claimed, that since the elimination of the old card catalogues, they had been unable to work effectively and felt that the "innovation" had brought them "one giant step backwards."

The attitude of some of the subjects interviewed was similar to culture shock described in anthropological literature.[1] Oberg[2], who is credited with coining the term, describes the condition as "anxiety that results from losing all of the familiar signs and symbols of social intercourse". With respect to computer use there is a "feeling of impotence from being unable to deal competently with an unfamiliar environment." To this must be added the concept of ethnocentricity, which in anthropological terms means translating unfamiliar cultural manifestations into one's own culturally familiar terms. However, ethnocentricity often means making value judgments based on one's own, culturally inapplicable but supposedly superior moral supremacy. If applied to the problem of computer literacy among the present adult population there were among our subjects scholars reluctant to accept electronic media as superior or even similar to book forms. They claimed that the computerised systems were inferior to the old system of subject catalogues. Ethnocentricity can take many forms, all of which can be detected in the arguments of the computer illiterates:

a) The alien concept is "anti-intellectual and primitive", not up to known standards, and therefore dangerous and probably morally deficient.

b) The way to deal with the new is by denouncing it as wrong, accusing those who embrace it of worshipping false gods and by clinging nostalgically to the "good old days of pristine purity".

c) The newfangled ideas can be fought every inch of the way, even though for financial and practical reasons they have already been accepted by society.

d) The new can be belittled ideologically. The last resource of the ethnocentrist is often the claim that adopting the innovation is a perversion, bordering on the magical and those who sanction its use should be held responsible for its ill-omened effects.

In this mood, computers can be perceived as hostile, unfriendly and unreliable to the computer illiterate, who tends to accuse the machine of his own short comings much in the same way as culturally "superior" people tend to belittle the culture of other societies. It is true, that for the older computer illiterate it may be downright humiliating to have to appeal repeatedly to a student instructor, half one's age, for assistance. On the other hand it is not much of an excuse to have grown up in a book-centered society. Other people with a similar background accept the reign of computers and adapt to them. Therefore to the computer literate the fault is in the reluctant users, not in the machine readable system.

Regarding the younger computer illiterates, excuses can also be made: parents refused to buy a computer, computer training in school left practically no trace, there is a personal disinclination to have anything to do with keyboards and other machines etc.[1]

From the point of view of the reference librarians, these types of readers are problematic. It is necessary not only to provide instruction in computer techniques and retrieval of information by computer, but also to break down the psychological barriers and reduce anxiety. This is not necessarily possible to do by librarians trained in library techniques but not in clinical psychology, and reassurance is difficult to bestow when a long line of waiting patrons is forming, threateningly, in front of the reference desk.

There is a wealth of literature on user training, but many of the techniques developed do not necessarily take all the human elements into account. People, as can be seen from the above, differ greatly in their attitudes to computers as a means of retrieving information, and techniques for user instruction must perforce take this human variability into account.

The retrieval system that a certain library uses is one unified program as a rule. There may be a number of tools, such as CD-ROMs that have slightly different commands, but once a reader has somewhat mastered the basic steps of one program and arrived at a printout of information, whether the query was well formulated or deficient, there is a tangible result of success. It is the more sophisticated library user who begins to wonder whether the printout in fact represents the answer to the query. The first year student is often satisfied with the list that the computer has spewed out. In the Library of the University of Haifa, students vastly prefer Hebrew and Arabic texts to English material[4] and rarely go on to the foreign language material if what they have found in their own languages seems to them sufficient.

Further on in the course of studies, especially on graduate level, the evaluation of information retrieved by computer becomes more demanding, but by that time, the mere technique of retrieval has already been learned by many, even some apprehensive ones. Those who manage to avoid learning go for more thorough searches for material with the help of librarians, and avoid any confrontation with the computer by using others to do their searches for them.

The newcomer on the scene of many academic libraries in Israel is the CD-ROM. While outwardly similar to the now more or less familiar computer retrieval, CD-ROMs seem to raise anxiety levels among many users, even computer literate ones. One problem is that the programs controlling retrieval are specific to single CD-ROMs and therefore the commands learned for the use of one do not necessarily apply to others. New approaches to retrieval must therefore be mastered for each CD-ROM. Even with a detailed manual at hand this can be laborious and very time consuming, and if there is need to go from one CD-ROM to another in quick succession, the search can become very confusing.

Moreover, retrieval by computerised catalogue and by CD-ROM permits Boolean searches, and this implies the understanding of fundamental principles and the way they have been applied in each type of source whether catalogue or CD-ROM. However, certain CD-ROMs contain full texts, for example of encyclopedias and law compilations. This makes any search much more complicated and time consuming, and even young students who claim to know everything about computer retrieval are often stymied by their inability to get precise and complete information. Apparently, adequate information can be obtained from CD-ROMs by experience and reference librarians need to acquire it in the course of helping endless lines of more or less unskilled users. A reader needs a lot of time before an adequate level of skill and experience is acquired. What complicates matters even more is that most readers need more than one database for their information requirements and there is a lot of overlap in the information to be found in separate CD-ROMs. This has to be taken into account by the reader, who more often than not is getting much more information than he or she needs or is capable of evaluating immediately. Here too the problem of reading pages of text on screen is difficult and avoided by the users, who tax the printers to their utmost capacity by endless printouts, which have to be compared to eliminate duplication, superfluous or irrelevant items as well as bibliographic items of little scientific value for a particular study.

The Reference Librarian

From the reference librarian's point of view several points need to be discussed and a solution found.

The problem of how to organise instruction to a large number of users is a critical one. It is mainly solved by a combination of measures which permit a user to learn the rudiments of information retrieval by computer through

a) one session or several training sessions run by the reference librarians who teach basic search techniques.

b) being helped by reference librarians in specific problems that could not be solved by the reader. On these occasions the librarian uses his or her superior skill and experience to solve the problem but cannot at the same time do more than explain in general terms the process of searching. Some readers learn from this experience and apply it to subsequent searches, others decide that the best way is to go to the librarian for every search and let the reference desk do the job. Obviously, nothing is learned in this manner and the user becomes completely dependent on librarians or on more knowledgeable fellow students for all retrieval tasks.

c) written manuals that clearly explain the steps to take in retrieval and the exact way by which commands should be given are placed near the computer terminals. This is an indispensable practice for several reasons: first it relieves the librarians from the obligation to help those who prefer this way of learning retrieval, second it reduces anxiety among those who are too shy or unwilling to demonstrate their ignorance to librarians and it also helps those who work better with written than with oral instructions. Moreover it enables two or more users to put their heads together and try to cope by pooling their sometimes meagre resources. This is a laborious and inefficient way of learning retrieval techniques and some informants claimed that they found it difficult to apply what was learned in one specific search to one on another subject altogether. Some were found to be unaware of the existence of thesauri and terminologies, others had difficulties in translating Hebrew and Arabic terms into the English terms of the computer and CD-ROM subject categories.

These means of transmitting information on retrieval are absolutely indispensable, and it is doubtful if reference work can be done without these or similar techniques. However, not all the users computerised catalogues in academia can acquire the necessary skills through such training methods. What apparently is needed is not training such but rather education. Education means, in addition to being based on a process of socialisation, that the familiarity with a new technique must be acquired over a period of times, gradually and in a structured manner. What the above mentioned measures amount to is training at its most superficial. If librarians wish to have users take the best advantage of computerised means of information retrieval, they will have to do more than train, they will have to educate. This consequently raises a problem: is it the duty of reference librarians to educate people in computer literacy, or is this the duty of some other framework within academia, while librarians concentrate on their appointed task: the precision of information retrieval.

Obviously the present situation is a passing one: the computer illiterates are hopefully a transient phenomenon, a generation in the wilderness. Future users will probably come to academia fully capable of coping with computers and multi-media. But the need for education in computerdom is here and now.

Beyond CD-ROMs, multi-media are making their first appearances. Even more sophisticated machines and programs will have to be mastered to make full use of the marvellous opportunities that multi-media are expected to offer. Programmers will undoubtedly do their utmost to make the retrieval as user-friendly as possible, but the problem of user-friendliness is a complicated one: programmers are well aware of the inner workings of the machines they are using, and they invent the logic upon which the programs are based. All this is unknown and hidden from the average user. Thus what is absolutely crystal clear and should not cause any anxiety or difficulty whatsoever according to the programmer can be completely baffling to the average academic user. Nevertheless, for a trained academic scholar it is essential to understand the underlying principles of disciplines other than his or her own field of research. This means that the thought processes of another subject matter such as information retrieval must be comprehended by the academically trained as otherwise the process of adaptation to the new medium becomes inadequate and inefficient.

Consequently, an hour long training session in the use of a complicated, and incompletely understood system will not satisfy the need to know of the scholar in academia and will make him or her helplessly dependent on the librarians and on their student assistants or their fellow scholars.

There is no obvious easy answer to this problem: one is to make computer literacy a compulsory first year course for new students, which would then make the work of the reference librarians easier, and permit them to concentrate on their real job, that of information retrieval, instead of spending time and energy in explanations which key to hit. Another would be to widen the scope of the library's reference instruction so as to encompass more computer literacy, but it is likely that this will place too great a burden on the team of reference services. For the University of Haifa Library's small staff of reference librarians training a student body of twelve thousand and a teaching staff of some five hundred teachers would be an impossible mission. A third solution could be to create retrieval systems that are not only "user-friendly" from the point of view of the programmer, but also from the perspective of the anxious computer illiterate. This raises at least two difficulties: one that there is a limit to what can be done to facilitate retrieval: help menus, on-screen instructions and manuals do not seem to solve the problem entirely. Reducing the retrieval methods to a minimum would probably result in less accurate retrieval, as the many possibilities inherent in the more sophisticated programs would not be exploited by the readers, who would be satisfied with using only the most basic, simple measures of retrieval and not venture into the more complicated but effective search techniques.

For the next decade or so the problem of library instruction is likely to haunt reference librarians. As increasingly sophisticated software is presented to the academic community, the need for an answer to some of the questions raised above will become increasingly pressing. One of the solutions with some promise of success is to introduce literature searches and information retrieval as an obligatory course in the first year of academic studies, so that when the time comes for the student to make precise searches for information, the principles of computer use and information retrieval would already be part of the student's store of competence. Such clients could then profit fully from the help of the reference team, who could concentrate on increasing precision of the search and on better evaluation of the material retrieved. However, this would solve the problem of the students, not of the academic staff. For these, intensive training sessions could be constructed, to be taught on an individual basis, according to the special conditions of the staff member's academic discipline and the peculiarities of his or her special interest. Experience has shown that such training is an efficient way of transmitting information, but in the present circumstances, when reference librarians are expected to serve thousands of students, the training of teachers cannot be consistently and efficiently carried out. However, if the burden of training students in information retrieval is carried out during a first year course, more time can be devoted to helping the academic staff and this could be beneficial to all those concerned: students would receive better bibliographical lists from teachers skilful in using computers for information retrieval, teachers would spend less time in hapless attempts to convince the computer into doing their bidding and librarians would have more time to carry out what they have been trained for: sophisticated information searches. Given the situation in many university libraries today, these measures are perhaps worth trying, at least on a temporary basis, until their suitability or inefficiency can be evaluated and readers can arrive by their own efforts at optimally precise searches of bibliographic material.

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4. About 20% of Haifa University's student body has Arabic as mothertongue, and the catalogue presents the three alphabets, Hebrew, Arabic and English. However, some Arab students reported that they prefer reading Hebrew to reading in Arabic because the vernacular spoken in Israel has several variants within its small boundaries, while the outside Arab world, which provides most of the library material in Arabic also tends to have some dialectal differences

which make reading difficult. A prominent Arab writer and journalist, Salman Natur explained in a private conversation in 1993 that in reading aloud to his children he often found himself paraphrasing the text, so as to make it understandable. Thus Hebrew, while a second language for the Arabic speaking student, is sometimes preferable to Arabic texts. Both Jews and Arabs have trouble with reading English, even though it is taught in Jewish schools from grade four and in Arab schools from grade six. Both therefore resist attempts by the teacher body to make them read English language texts, unless this is absolutely unavoidable, and homemade translations (mostly very bad and inaccurate ones) circulate among the students. The translations are often recognizable by teachers who find the same mistake, due to a faultily and misleadingly understood English expression in the papers and tests of those why rely on the same translation!

Information Superhighway : The Role of Librarians, Information Scientists, and Intermediaries

Conference Summary

Jenny Walton

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Jenny Walton started her career in IT in the 1960s when paper tape and punched cards were in vogue. After 9 years in the commercial IT sector, she moved into library automation and has since been unable to escape. She has been a freelance consultant, mainly doing IT development, during all her time in libraries. She has worked at the British Library on subject indexing and the catalogues, for REBUS at the University of Lausanne in Switzerland (Réseau des Bibliothèques utilisant SIBIL) on hierarchical and Boolean search systems for the catalogues, for News International plc on the automation of cuttings libraries for the Times, Sunday Times, the Sun and the News of the World etc., and for Automated Library Systems Limited on InfoCentre.

This year we have had a particularly large number of papers, 33 in all, and so I have restricted the summary to those which actually addressed the main theme of the symposium, i.e. the Information Superhighway and the role of librarians et al.

Firstly I think it might be helpful to consider the difference between the points of view of librarians and users. Librarians see the Information Superhighway as an opportunity to solve problems of information and document availability and document delivery. Users see the Information Superhighway as a means of access to all knowledge instantly and free of charge, in fact a passport to paradise. One of the roles of librarians must be to mediate between these viewpoints.

Also, I think that we need to try to understand the relationship between the Information Superhighway and the Internet. The Information Superhighway is potentially wider than the Internet, but the concept has arisen because of the Internet.

We have heard much amazing jargon and metaphor comparing the Information Superhighway with industrial and transport systems, which presumably means that we are still struggling to understand the concept.

We have also heard some interesting quotations from yester-year indicating that librarians faced similar problems when dealing with the large numbers of books and journals generated by the printing and publishing revolutions. The emphasis had to change from storing all material to storing an apposite selection of material. This is mirrored today by the need to search for and select material suited to an individual's needs. The sheer scale of the quantity of material available makes it imperative to use electronic methods such as the Information Superhighway and concomitantly to store the material electronically to alleviate problems of document delivery.

Sheila Corrall gave us a most comprehensive review of the skills that a librarian will require in the future. In particular librarians will have to acknowledge change as a way of life, they will need to be technologically literate and they will need continuing education to keep up-to-date with the technology available to libraries and the facilities required by users.

The librarian will need to develop sympathies with the research topics of the individual users and I liken this to the 'nose' of a whisky blender in a hi-tech distillery when creating a personal blend!

Michel Bauwens introduced some serious jargon, a 'cybrarian'. He pointed out that librarians want to organise the Internet while many people don't want it organised. I think the latter are called 'cybernerds'. The Internet allows everybody to become his own publisher and we could revert to using raw information instead of pre- and partially digested publications. I am not sure whether this is an entirely good thing, but it could be that scholarly surveys of topics will survive as books alongside the raw information on the Information Superhighway. Michel likens the process of retrieval to that of an 'information refinery with a customised information flow'.

Johan de Vries refers to the Internet as the 'backbone of a refinery structure', also that we are 'drinking from fire hoses' unless we impose librarianship to control the flow, e.g. bibliographic control of Internet resource guides. He pointed out that cooperation with publishers and users is needed.

I would say that librarians are effectively replacing publishers because the high currency of the Internet information resources offers users an opportunity to request a selected topic search on the latest material before an up-to-date book on the topic could be published.

Herb White's paper was bravely delivered by Bernard Gallivan. It stressed the way that users personalize their information collection, i.e. they refuse to 'drink from fire hoses'. Kathryn Arnold also refers to a personalized electronic bookshelf in her later paper on the electronic library at de Montfort University. Herb said that a flood of information is the enemy of intelligence and hence the need for intermediaries. We heard some colourful references to phenomena such as 'road sign painters', 'meatware' and 'the dirt road of document delivery'.

Greg Anderson described the cooperative ventures at MIT between librarians and IT people, the Distributed Library Initiative. This attempts to unify many resources such as library catalogues, CD-ROMs, electronic journals (TULIP) and visual collections. The medium of cooperation is MITnet with a standardised protocol such as Z39.50. Licensing models are being developed by the electronic journal vendors for networked use.

Unfortunately there is no attempt at unified subject indexing, but given the scale of the problem this is not surprising.

Andrew Torok wins the prize for the most jargon. He told us of 'speedtraps', 'super toll plazas', 'fines', 'cybernerds', 'flaming' and much, much more. He also pointed out how much the Internet is used for entertainment. In discussing the anarchy on the Internet he showed how it is self-regulating in that abusers receive hate mail and other admonitory devices. He also referred to 'paradigm paralysis', and I am still struggling with that concept.

It seems that librarians will need to be fully conversant with the jargon to help the users past the starting post.

Suzanne Fedunok spoke of the project at SUNY, Binghamton campus, to offer Internet and other resources with a single X-Windows interface. This highlighted the amount of time librarians need to spend with the users to introduce them to the Internet, also the need for librarian training.

Lisbeth Björklund pointed out the benefits of exploring the 'backroads' of the Information Superhighway, i.e. serendipity, and 'it's not the goal but the road that counts'. Hence the need for both browsing and targetted searching.

I would comment that browsing has always been greatly ignored compared with targetted searching in traditional automated catalogues. This has been due, in part at least, to the limitations of computer systems. There is now an even greater need for browsing when dealing more directly with the information and this is an opportunity not to be missed to improve information retrieval techniques. The technology today is vast compared with that available when many of the traditional automated catalogues were first conceived, and it is to be hoped that new techniques will benefit the searching of both automated catalogues and electronic document collections.

Christine Bossmeyer spoke of open communication between libraries and information systems and of networking at national, regional and local levels in Germany to facilitate interlibrary lending and document delivery. This is complemented by the later paper of Alex Klugkist about international interlibrary cooperation across the border of Germany and the Netherlands.

Titia van der Werf-Davelaar spoke of the Internet engineering community and the IETF and IRTF, respectively the Internet engineering and research task forces. They produce technology driven systems architecture but cooperation is needed with the information specialists to produce human guided solutions, customer-oriented servers. The organisation and cataloguing of resources has begun and a manageable Internet is the goal. URLs (Universal Resource Locators) are a tool to help in the cataloguing process and these are roughly equivalent to an ISBN.

Wilf Lancaster told of his recent study on the nature of electronic publishing. There is a vision of academics regaining control of their intellectual output through scholarly electronic publishing on the Information Superhighway and the practices of commercial publishers are facing change. He studied a group of library directors and research administrators from institutional members of the Association of Research Libraries. Neither group were optimistic about achieving the vision, it is not receiving a high priority for resources and the system of reward is seen as a problem to be resolved.

Maurice Line discussed the issues of costs of information and paying for it and concluded that it's the institution that pays at both the publishing and consumer ends. However, life with restricted information would be unbearable and he treated us to an analogy of life with only a loin cloth for clothing and only nuts to eat. Therefore we should be concerned about those who cannot pay because they have no economic power and who are without economic power because they have inadequate information. This circle needs to be broken and the Internet offers a partial solution, but the overuse of this resource means that it cannot be free. Maurice suggests that there could be subsidies for information supply to the developing countries and as a starting point the publishers could give their journals free of charge. But this is unlikely. The institutions could take back the publishing initiative as was discussed in Wilf Lancaster's paper and this could lead to greater altruism and vision in the universal supply of information.

Alex Klugkist described the OBN, the Open Library Network, in the Netherlands. It is a cooperative venture between the academic libraries in the Netherlands, and it will soon include the public libraries and cross the border into Germany for international interlibrary lending. This complements the cooperative efforts in Germany that were described by Christine Bossmeyer.

David Stoker spoke about the need for evaluation of resources on the Information Superhighway, and pointed out how this topic had been implicit in several of the papers already presented. He suggested several criteria and concluded that we are dealing with a hybrid information environment and that the evaluation of resources should be based upon understanding.

Stephen Richard and Paul Nieuwenhuysen each described the development of presentation material for Computer Aided Learning for Internet and information retrieval topics. The non-sequential learning methods described here mirror the non-sequential retrieval possibilities for use of the Internet as an educational resource and the advantages of these methods are already proven.

Anthony Angiletta spoke of the major preparation for electronic resources at Stanford whilst grappling with the problems of retaining book collections. The strain can be reduced through application of the three R's, Repositioning, Restructuring and Redesigning. The priorities for a librarian are the retention of scholarship, the peer relationship with faculty and subject knowledge, i.e. 'know the stuff of scholarship'. The skills of intermediaries are indispensable and the role of librarian education is automatically acknowledged.

Kathryn Arnold has actual experience of managing an electronic library at de Montfort University and finds that print is preferred to electronic as a document medium, given that print copies are available, but searching by electronic methods is preferred. The concept of an electronic library is liked by the students, also the facilities for natural language searching. Students tended to create their own personalized electronic bookshelf. Electronic documents might be better appreciated if they can offer some advantage, e.g. increased accessibility.

I would suggest that the more that electronic documents incorporate multimedia features the more they will be appreciated.

Sigrid Reinitzer's paper was particularly enjoyable because it described a really serious development of a virtual library which unifies print and electronic media, and even includes provision for a workstation for the blind, with braille keyboard and printer, which is connected to the Internet.

It was interesting to hear that the Jesuits had interlibrary lending and one wonders how it was managed in the 17th and 18th centuries. One is reminded of Herb's 'dirt road of document delivery'!

The paper also illustrated an encouraging view (from the librarian's point of view) of the need for librarians as intermediaries in the electronic and virtual library.

That is the end of my comments about individual papers, but I would like to add a few thoughts of my own.

What is so significant for librarianship is the universality of the Internet. Earlier this year I went to the Internet conference in Prague and was astonished at the number of nations that were represented, from the poorest to the richest and the smallest to the largest. Many of the emerging nations see the Internet as a means of overcoming decades of deprivation, of both educational resources and access to the wider world. The representatives from many of the poorer nations were funded by charitable foundations, such as the Soros Foundation, who clearly recognise the significance for educational purposes.

It is also the currency of the information on the Internet which makes the medium indispensable. All published material is out-of-date by the time it reaches the end user. With the institutions beginning to take back the initiative in academic publishing, the Internet can be thought of as a world wide daily newspaper.

Any good newspaper has many information retrieval tools, such as headlines, font styles and sizes, colour, pictures, indexes, topic pages and sections, enabling the reader to employ non-sequential retrieval methods to select as much as is relevant or interesting, and no more, facilitating both precise access and serendipity. This has so much advantage over the serial presentation of television news.

The new multimedia features and tools that are becoming available on the Internet will enable the advantages of newspaper browsing to be available for the huge diversity of information on the Information Superhighway.

I would emphasise that it seems imperative to encourage unified subject indexing and this would be one of the most important tasks for librarians.

The issue of charging for information is also highly relevant and librarians will need to devise charging policies for the Information Superhighway to allow it to expand and thrive by remaining usable and pertinent. This process will parallel the issue of charging for the use of the Internet itself. The vast use of the latter is leading to it becoming a victim of it's own success and charging policies will help to control the traffic.

The role of librarians et al. in the Information Superhighway therefore seems to comprise at least the following tasks:

- familiarity with the technology, resources and jargon
- training users in the use of the technology
- subject specialism for relationships with faculty
- subject indexing
- promotion and adoption of standards
- assignment of URLs
- establishing charging policies
- fighting for the resources to offer a viable service

It seems to me that these tasks are so fundamental to universal use of the Information Superhighway that, regardless of the attitudes of the 'cyber-nerds', librarians will get to organise the Internet!

Index

AAT *see* Art and Architecture Thesaurus
Academic administrator(s) 207 ff.
Access to information 23, 33 ff., 71 ff., 108, 150 ff., 165, 216 ff., 262, 293, 338 ff., 366, 370
  - less developed countries 273
  - necessity for waste 263
ALEPH 255 ff., 374
API *see* Application Programmer's Interface
Application Programmer's Interface 98, 186 ff., 240
Archie 17, 151, 200, 306
Armstrong, J. C. 291
ARPAnet 136
Art and Architecture Thesaurus 97
Article Express 20
Athena 63 ff., 155
Automated Circulation System 363

Bates, M. C. 236
Bias 250, 303
Bibliotekstjänst 243 ff.
Binghamton University 148 ff.
Biological Abstracts 319
Blind users 365
British Library 244 ff., 279, 306
Bulletin board(s) 16 ff., 67, 152

CAL *see* Computer Aided Learning
CALIBRE 20
Campus Wide Information System 20 ff., 83, 226 ff., 283
CAPCAS *see* Computer Aided Production for Current Awareness Services
Carnegie Mellon University 240
CATRIONA project 306 ff.
CD-ROM(s)
  - information system 363 ff.
  - products 288 ff., 375
  - search engine 121

- server 129, 131 ff.

Censorship 75, 134 ff.

Charging
  - for library services 271 ff.
  - for networked information 290 ff.
  - for publication 267 ff.

Chicago University 289

Client/server
  - architecture 257 ff.
  - distributed client-server computing 293 ff.

Clipper Chip 142

CODEN 121

Collection development, continuity and change in 347

Commercial security 297

Communication stacks 181 ff.

Communications channel 292

Computer Aided Learning 318 ff., 399

Computer Aided Production for Current Awareness Services 226 ff., 233

Computer literacy 96, 370 ff., 384 ff.

Copyright 5 ff., 20, 87 ff., 111, 125, 172, 294 ff., 350 ff., 366

Costs of
  - access to information 262 ff.
  - databases 263 ff.
  - management 378 ff.
  - publishing 263 ff.
  - research 265 ff.

Curators 95

CWIS *see* Campus Wide Information System

Cyberspace 12, 249, 381

Cybrarian(s) 4, 12, 396

Danton, J. P. 289

Database
  - management layer 255 ff.
  - search techniques 319 ff.

DBV-OSI II 180 ff.

DECnet 125 ff.

Deregulation 134 ff.

Dewey, M. 40, 288

Dickenson, G. K. 291
DIP *see* Document Image Processing
Document
  - delivery 115, 181 ff., 244 ff., 277 ff., 364 ff., 395 ff.
  - ordering 190, 243 ff.
Document Image Processing 351
Drucker, P. 59

EASE *see* Elsevier Articles Supplied Electronically
Electronic
  - collections 235 ff.
  - discussion groups 292 ff.
  - journal 73 ff., 151, 381, 397
  - newsgroups 301
  - publishing 10, 20, 86 ff., 144, 227 ff., 398
Electronic Library and Information Online Retrieval 92, 349 ff.
Electronic Library Image Service for Europe 90 ff.
ELINOR *see* Electronic Library and Information Online Retrieval
ELISE *see* Electronic Library Image Service for Europe
Elsevier Articles Supplied Electronically 233 ff.
Epoque 124 ff.
EURILIA 20
Excerpta Informatica 236 ff.

Fairthorne, R. A. 234
Fielden Report 9, 111
File Transfer Protocol 16 ff., 105, 133, 170 ff., 201 ff., 227 ff., 240, 292 ff., 336
File Transfer Protocol/Internet Protocol 227 ff.
FirstSearch 83, 151 ff., 177, 243 ff., 279
Follett Report 9, 18, 108 ff.
Freeware 296, 336
Front end system mind 236
FTP *see* File Transfer Protocol
FTP/IP *see* File Transfer Protocol/Internet Protocol
Fulcrum 101
Functionality layer 255
Fuzzy searching 354

Genealogy 299
Global Internet Library Connection 143
Gopher 17 ff., 131, 143, 151 ff., 170 ff., 197 ff., 283, 293 ff., 335 ff., 375 ff.
Granick, L. 291
Graphical User Interface 152, 240, 256, 351 ff.
GRIBS 363 ff.
Gutenberg, Project 151, 300

Harry, V. 291
Heterogeneous desktop 124
Higgens, G. L. 290
Home Page 300 ff.
HTML *see* HyperText Mark-up Language
HTTP *see* HyperText Transport Protocol
HyperText Mark-up Language 16, 171 ff., 203, 241, 292 ff.
HyperText Transport Protocol 240 ff.

ICONCLASS 97
IETF *see* Internet Engineering Task Force
IMpact on People of Electronic Libraries 108 ff.
IMPEL *see* IMpact on People of Electronic Libraries
INDEX+ 98 ff.
Ingres 238
Institutions
  - as publishers 264 ff.
  - bearing of information costs 265 ff.
Integrated Services Digital Network 140
Intelligent agents 24
Interlibrary cooperation 276 ff., 398
Internal format 121
Internet Engineering Task Force 176, 195 ff., 398
Internet One 148 ff.
Internet Research Task Force 172 ff., 195 ff., 398
IRTF *see* Internet Research Task Force
ISDN *see* Integrated Services Digital Network

JANET *see* Joint Acadamic Network
Jesuit Order 361 ff.

Joint Academic Network 110 ff., 365
Joint Photographic Expert Group 104 ff., 236 ff.
JPEG *see* Joint Photographic Expert Group
Jukebox 126 ff., 241

Kalin, S. 293
Katz, W. A. 290 ff.
Kristensen, J. 236
Kroeger, A. B. 289 ff.
Kwik Search 240 ff.

LambdaMOO 143
Large, J. A. 290 ff.
Layer approach 256 ff.

MAE East *see* Metropolitan Area Ethernet East
MAN *see* Metropolitan Area Network
Management
- of change 115, 262
- styles 6
Massachusetts Institute of Technology 61 ff., 397
Meatware 56 ff.
MECANO 117 ff.
Mercury 92, 240
Metadatabase 236
Meta-information 17 ff.
Metropolitan Area Ethernet East 137
Metropolitan Area Network 363
Minimalist instruction 315 ff.
MIT *see* Massachusetts Institute of Technology
Model of informative communication 232 ff.
MOO *see* Multi-user Online Object-oriented
Mosaic 81, 98, 161, 170 ff., 194, 253, 257 ff., 294 ff., 354, 376
Mudge, I. G. 289 ff.
Multi-user Online Object-oriented 23, 143

National Information Infrastructure 134 ff.
National Information Infrastructure Testbed 139

National Research and Education Network 135 ff., 381
NetBEUI 126 ff.
NetScape 98
Networked information 1, 32 ff., 61 ff., 145, 177, 194 ff., 287 ff., 336, 381
- bibliographic control 23 ff.
Networked Information Retrieval tools 14 ff., 26
New Guide to Reference Books 289 ff.
NII *see* National Information Infrastructure
NIIT *see* National Information Infrastructure Testbed
NIR-tools *see* Networked Information Retrieval tools
Norman, S. 290
NREN *see* National Research and Education Network

OCLC 79, 150, 173 ff., 243 ff., 279
ODBC *see* Open Database Connectivity
OmniWare 124 ff.
Online Contents project 232 ff.
Online Public Access Catalog(s) 16 ff., 96, 117 ff., 150 ff., 180 ff., 202 ff., 228 ff., 258 ff., 282 ff., 292, 306 ff., 322 ff., 354, 361 ff.
OPAC *see* Online Public Access Catalog
Open Database Connectivity 101
Oppenheim, C. 291, 368
OSF/Motif 124 ff.

Patent(s) 124 ff.
PATSOFT 124 ff.
Pentium Library Controller 125 ff.
PeriLIB-777 124 ff.
PeriTEC 124 ff.
PhotoCD 99 ff.
PICA 123, 185, 233 ff., 278 ff.
PostScript 235 ff.
Powerpoint 331 ff.
Presentation software 325 ff.

QUBIC *see* Query By Image Content
Query By Image Content 97

RAID 133
RAMA 92
Retrieval
  - by reformulation 242
  - precision. 383 ff.
Rettig, J. 297
Roget's Thesaurus 300
ROMARIN 129

Scalable Internet 199 ff.
Scholarly publishing 202, 207 ff.
Science-tree 15
Search-aid thesaurus 236
Semantic structure 234 ff.
Shareware 292 ff.
Sheehy, E. 289
Shera, J. H. 288
SilverPlatter 121, 265
Spiders 24, 375
SR/Z39.50 181 ff., 258
STILE 92
Strategic alliances 8, 21, 205
Swets 233
Swiss Patent Office 124 ff.

Tag Image File Format 104 ff., 232 ff., 351
  - decompression 240 ff.
TCP/IP *see* Transmission Control Protocol/Internet Protocol
Telnet 16, 132, 292
Tennant, R. 293, 336
Tiananman Square 301
TIFF *see* Tag Image File Format
Tightrope walker 13 ff.
Tilburg University 91 ff., 116, 230 ff.
Tracking 96 ff.

Transmission Control Protocol/Internet Protocol 22, 65, 91 ff., 129, 132, 139, 188, 240, 292 ff., 365
Typography 305

Uniform Resource
  - Identifiers 376
  - Locators 145, 198 ff., 336
  - Names 145, 197 ff., 376
UNIX 22, 65, 91 ff., 186, 236 ff., 293 ff.
URI *see* Uniform Resource Identifiers
URL *see* Uniform Resource Locators
URN *see* Uniform Resource Names
USBC 121
User(s)
  - charging 262 ff.
  - education 72, 230, 370, 377
  - instruction 112, 377
  - interface 73, 91 ff., 124, 132, 152, 194, 235 ff., 255 ff., 291 ff., 331, 350 ff., 370 ff.
  - studies 241, 351 ff.
  - support 243, 307
USMARC 118 ff., 376

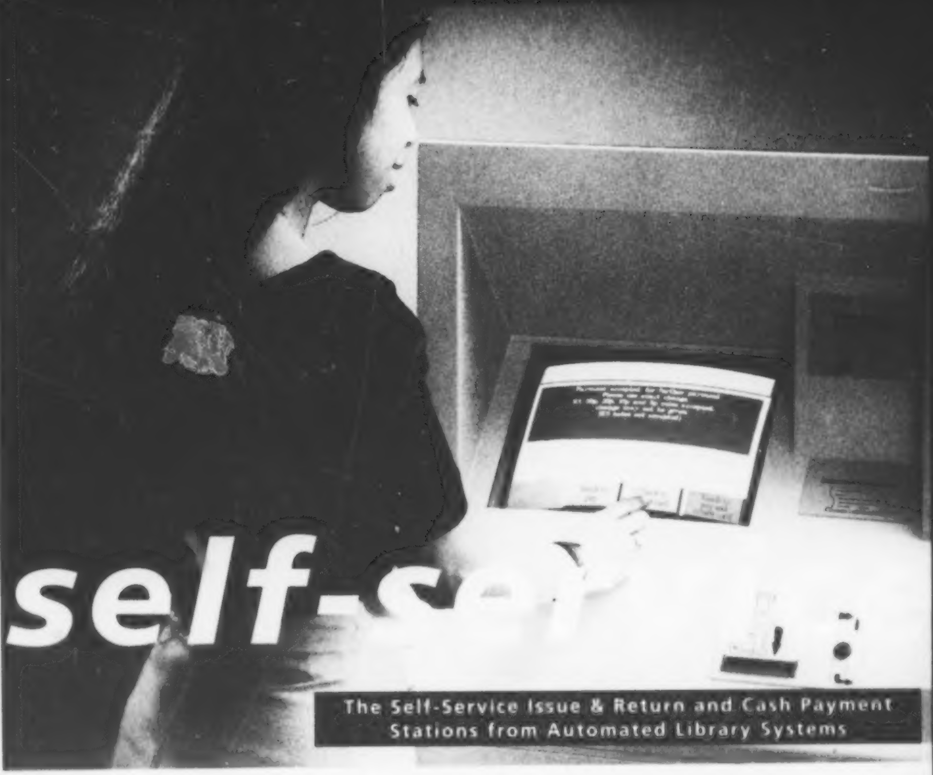
Value-added service 271
VASARI 92
Veronica 18, 151, 200, 293 ff.
Virtual
  - library 3, 51 ff., 110, 143 ff., 244 ff., 360, 361 ff., 369 ff., 400
  - library concept 363
Vubis 238

WAIS *see* Wide Area Information System
Weinstein, L. 295
Wide Area Information System 17, 151, 197 ff., 295, 375
Wiener, N. 50 ff.
Winchell, C. 289
Windows 99 ff., 126 ff., 135, 238 ff., 305 ff., 331 ff., 351 ff., 397
Windows NT 129 ff.

WINSOCK 105, 240
World Wide Web 17, 83, 98, 111, 131, 161, 230, 235 ff., 257, 283, 292 ff., 375
WorldCat 247 ff.
WWW *see* World Wide Web

X-Windows 65, 91 ff., 150 ff., 258, 305, 397

Z39.50 70 ff., 101 ff., 118 ff., 158, 181 ff., 235 ff., 258, 279 ff., 367, 397



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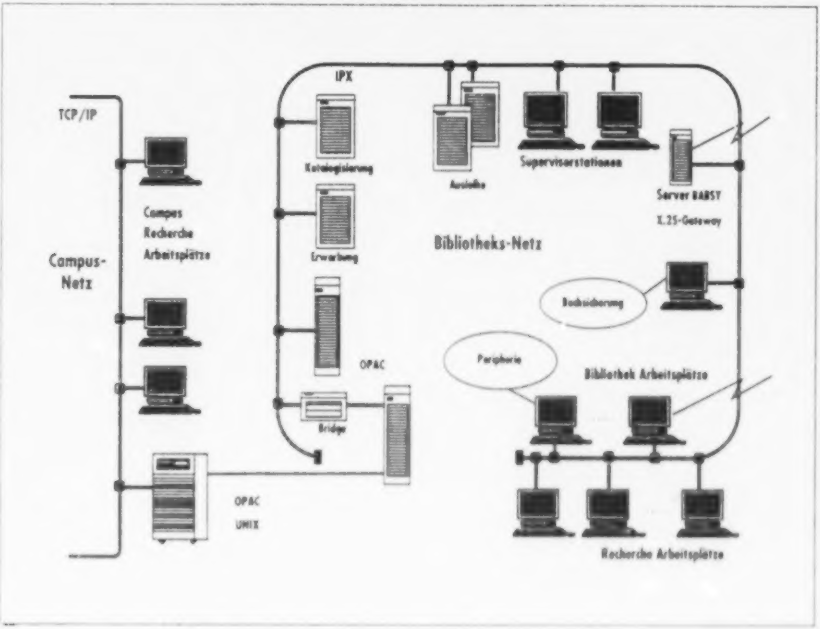
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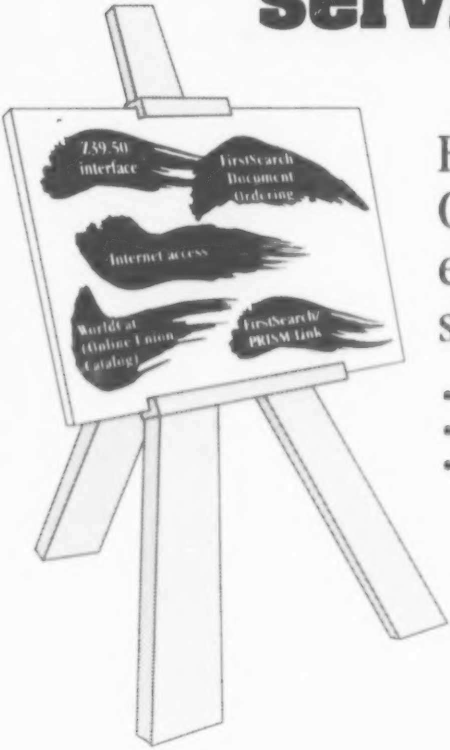
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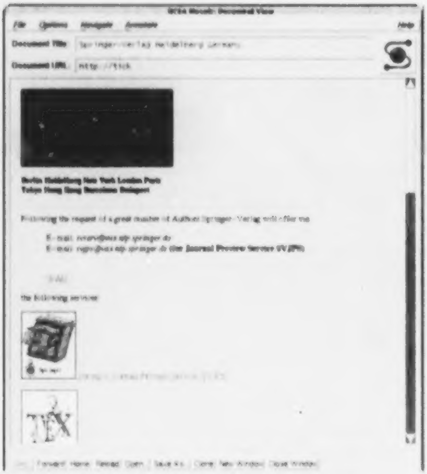

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